ENGINEERING AND MINING JOURNAL

A McGRAW-HILL PUBLICATION

AUGUST 1951

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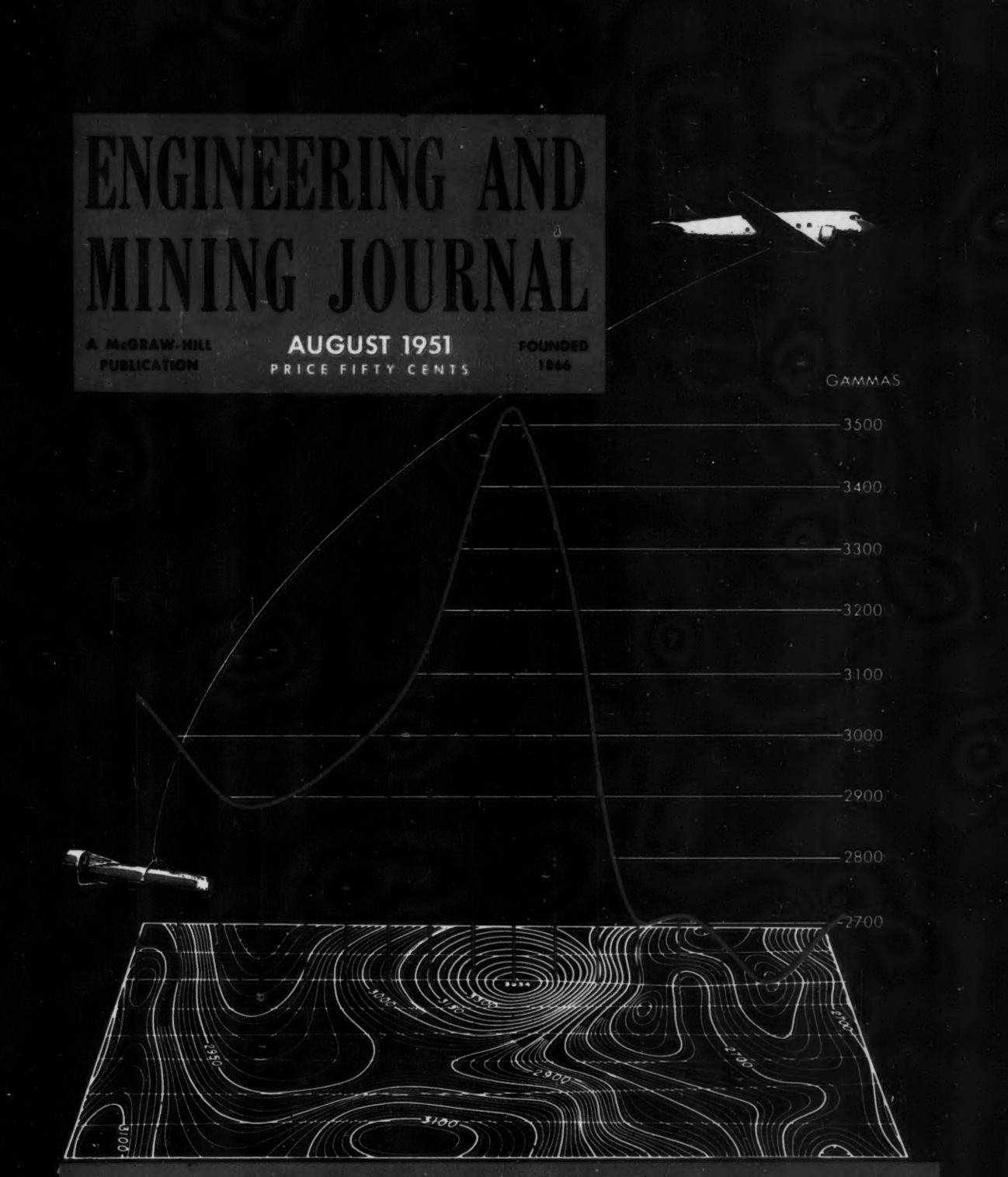
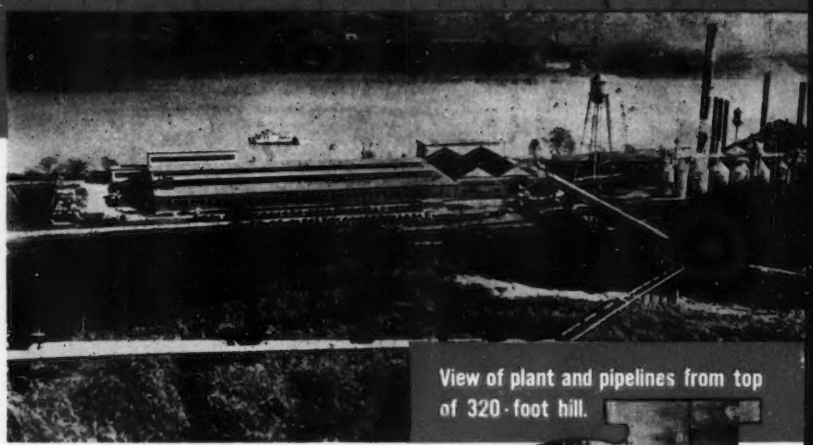


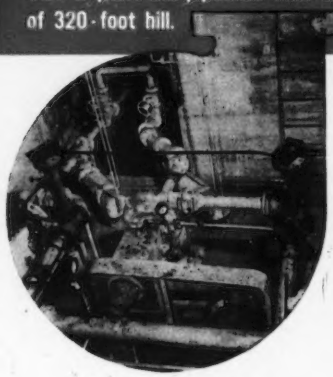
Read HOW THE AIRBORNE MAGNETOMETER DISCOVERED AMERICA'S NEWEST IRON OREBODY . . . See p. 56

SLUDGE that chews the heart out of most pumps



View of plant and pipelines from top of 320-foot hill.

Next to diamond dust, the abrasive diet of the Hydroseals at this grinding and polishing plant is about the worst that you can imagine for slurry pumps. Every day hundreds of tons of sludge, consisting of emery dust, powdered glass, fine silica sand, and other harsh abrasives, go into their innards. In addition, to push this material through more than a mile of pipe from the plant to the settling basin, they have to overcome a clearwater head of *540 feet*. The sludge is thick, containing about 33% solids, and is handled at the rate of 230 G.P.M. In spite of the tough operating conditions, no special maintenance has been necessary since the pumps were installed in 1946. It would be difficult to put Hydroseals to a better test and, according to the engineers at the plant, mighty hard to find better pumps.



One of the B-Frame Hydroseal Slurry Pumps in the main pump house.

For details on all Hydroseals, **write for Catalog 451.**

If you're planning to move anything from emery dust to gravel, we'd like to tell you the advantages of Hydroseal pumping. Our recommendations will be made without obligating you in any way.

THE ALLEN-SHERMAN-HOFF PUMP CO.
Dept. B, 259 E. Lancaster Ave., Wynnewood, Pa.
Representatives in Most Principal Cities

HYDROSEAL SAND, SLURRY & DREDGE PUMPS
MAXIMIX RUBBER PROTECTED

HYDROSEAL, PACKLESS AND MAXIMIX DESIGNS ARE COVERED BY PATENTS AND APPLICATIONS IN THE MAJOR MINING CENTERS OF THE WORLD

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TO CARRY

TO SET UP

TO DRILL

that's why the JL-4 JACKLEG

can increase your footage up to 50% or more

Take the JL-4 Jackleg into the smallest tunnel or tightest corner—set it up in an instant—collar the hole—and let the JL-4 do *all the work.* It supports the Jackhamer, absorbs the recoil, and feeds the drill uniformly into the rock.

Elimination of set-up time and faster drilling speed with smaller Carset Jackbits can increase footage as much as 50% in scram drifts, coyote holes, slashing in stopes, square set mining and sublevel work.

The new JL-4 embodies many new features for easier, more efficient operation. Feed legs up to 4' long plus extension pieces permit the use of longer steels—an improved pressure valve gives better control of feed rates—a finger-tip bleed-off valve gives instant pressure release—renewable clamping plates and a bayonet connection simplifies mounting the drill on the leg. The JL-4 is the result of 12 years experience in manufacturing and applying Jacklegs, in worldwide installations.

For complete information, see your nearest I-R representative. He is a skilled specialist in the application and servicing of every type of rock drilling equipment. He is backed by factory branch stocks and service in your vicinity.

This Complete I-R Combination has **NO EQUAL** for fast, efficient small-hole drilling

JL-4 JACKLEG
with
J-40 JACKHAMER
and
SERIES 113
CARSET JACKBITS

Comparative Tests—both in the factory and on the job—have proved that this I-R Jackleg Combination out-performs other equipment of its type in drilling speed. Air consumption and maintenance costs are exceptionally low.

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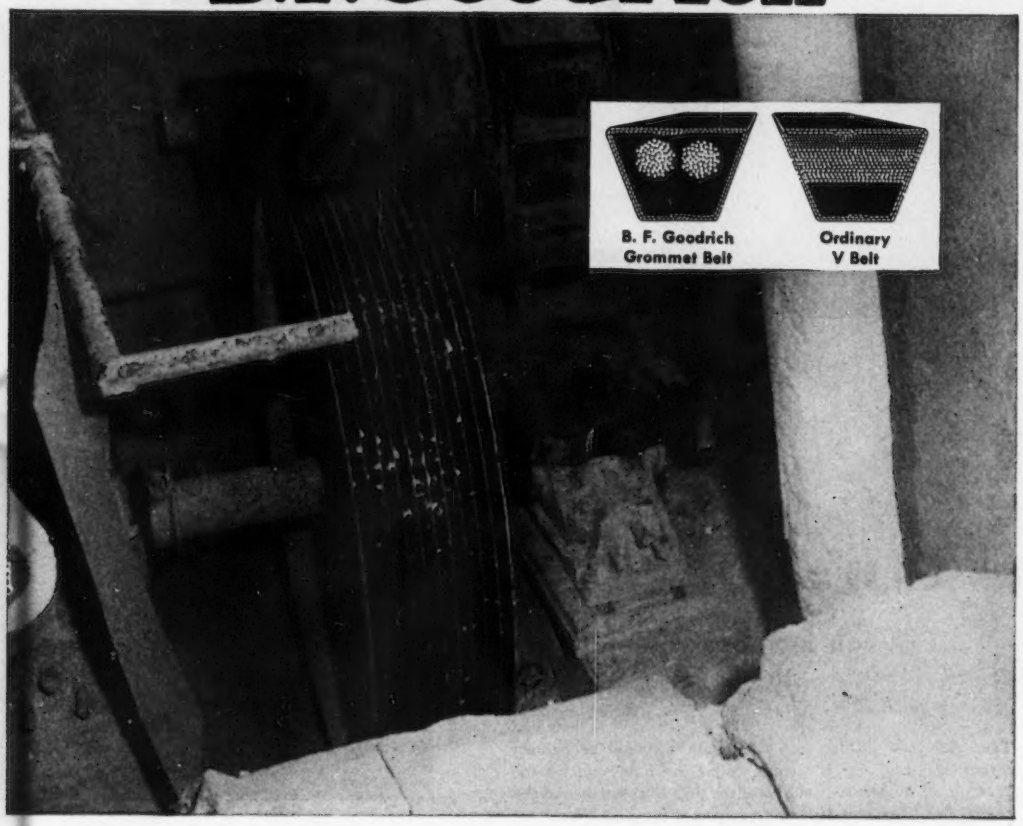
RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



Where a change to B. F. Goodrich grommet belts saved $100 a week

B. F. Goodrich grommet V belts cut costs 20 to 50%

WHAT would you do if you were spending $100 a week to replace failing V belts on one drive? That was the case in this mill — ordinary V belts failed in a week or less. They couldn't carry the terrific power load.

The company called in the BFG sales engineer and B.F.Goodrich grommet V belts were installed. That was 5 months ago and the grommet belts look as good today as the day they were installed. Here's why:

Endless — A grommet is endless, made by winding heavy cord on itself to form an endless loop. It has no overlapping cord sections. Because most of the failures in ordinary V belts occur in the region where cords overlap, the endless grommet belt eliminates such failures.

Concentrated cord strength — All of the cord material in a B. F. Goodrich grommet belt is *concentrated* in twin grommets, positioned close to the driving faces of the pulley. No layers of cords to rub against one another and generate heat; cord and adhesion failures are reduced.

Better grip, less slip — Because a grommet is endless, a grommet belt is more flexible, grips the pulleys better. Size for size, grommet belts will give ⅓ more gripping power, pull heavier loads with a higher safety factor.

Only B. F. Goodrich has the grommet!—No other multiple-V belt is a grommet belt (U. S. Patent No. 2,233,294). Now available in C, D and E sections. See your local B.F.Goodrich distributor. Ask him to show you his "X-ray" belt that illustrates grommet construction clearly. *The B.F.Goodrich Company, Industrial and General Products Division, Akron, Ohio.*

Grommet Belts BY

B.F.Goodrich

RUBBER FOR INDUSTRY

ENGINEERING AND MINING JOURNAL

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Published monthly by McGraw-Hill Publishing Co., Inc. James H. McGraw (1860-1948), Founder. Publication Office, 1309 Noble St., Philadelphia 23, Pa. Executive, Editorial and Advertising Offices: McGraw-Hill Building, 330 West 42nd St., New York 18, N. Y. Curtis W. McGraw, President; Willard Chevalier, Executive Vice President; Joseph A. Gerardi, Vice President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice President, Publications Division; Ralph B. Smith, Editorial Director; Nelson Bond, Vice President and Director of Advertising; J. E. Blackburn, Jr., Vice President and Director of Circulation.

Subscriptions: Address correspondence to Engineering and Mining Journal — Subscription Service, 1309 Noble St., Philadelphia 23, Pa., or 330 West 42nd St., New York 18, N. Y. Allow ten days for change of address.

Branch Offices: San Francisco 4, 68 Post St.; Chicago 11, 520 N. Michigan Ave.; Los Angeles 17, 1111 Wilshire Blvd.; Washington, D. C.; National Press Bldg.; Pittsburgh 22, 719 Oliver Bldg.; Detroit 26, 856 Penobscot Bldg.; Cleveland 15, 1510 Hanna Bldg.; Boston 16, 1427 Statler Bldg.; Philadelphia 3, 17th and Sansom Sts.; Atlanta 3, 1011 Rhodes-Haverty Bldg.; St. Louis 8, Continental Bldg. District Managers: New York, T. E. Alcorn; New York and New England, S. Kennedy; Philadelphia, W. A. Potter; Cleveland, W. M. Spears; Pittsburgh, H. C. Chollson; Chicago, C. J. Cosh; San Francisco, J. W. Otterson; Atlanta, R. C. Maultsby; Los Angeles, C. W. Dysinger; St. Louis, F. W. Kuetz. London address: McGraw-Hill Publishing Co., Ltd., Aldwych House, Aldwych, W.C. 2, England. Cable address: McGraw-Hill, London. Other McGraw-Hill foreign news offices in Paris, Berlin, Moscow, Prague, Shanghai and Mexico City.

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Entered as second class matter May 24, 1951, at the Post Office at Philadelphia, Pa., under the Act of March 3, 1879. Copyright 1951 by McGraw-Hill Publishing Co., Inc.—All Rights Reserved. Printed in U. S. A.

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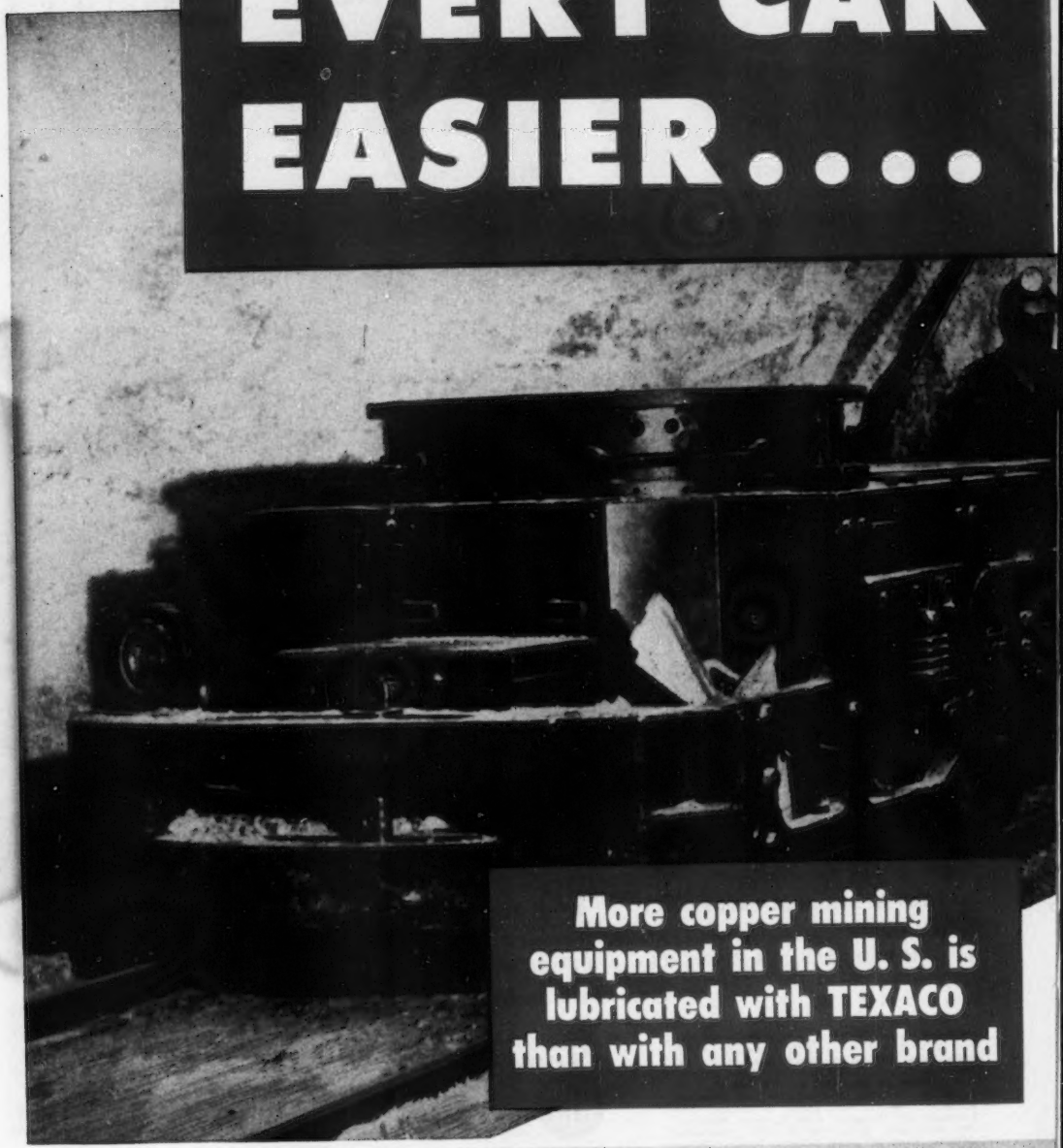

More copper mining equipment in the U. S. is lubricated with TEXACO than with any other brand

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Your cars get off to easy, power-saving starts, even at *winter* temperatures, when lubricated with *Texaco Olympian Grease.* Results are the same whether bearings are plain, cavity hub or anti-friction. In addition, bearings get the full protection that means longer life and lower maintenance costs.

Texaco Olympian Grease stays *in* the bearings, sealing out dirt and moisture. It resists oxidation and separation in both service and storage . . . provides long-lasting protection against wear. There are three consistencies of *Texaco Olympian Grease,* meeting all requirements.

On *open gears* and *wire rope,* you can reduce maintenance costs by using *Texaco Craters.* On gears, for example, *Texaco Crater X Fluid* goes on as a liquid, stays on as a tough, long-lasting, wear-reducing film. On wire rope, *Texaco Crater A* protects both strands and core, keeps rope strong longer.

A Texaco Lubrication Engineer will gladly help you simplify lubrication and reduce costs throughout your mine. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

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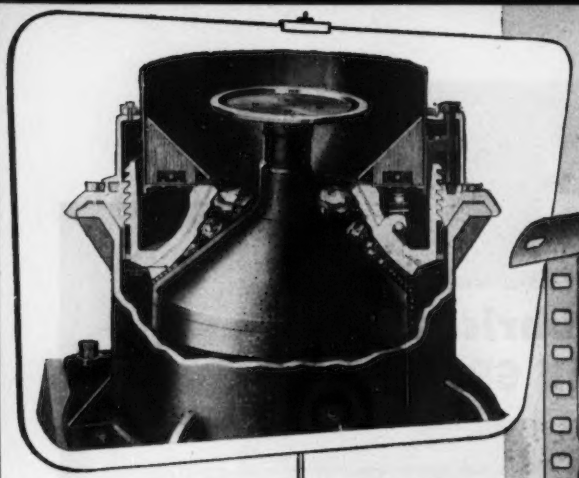
FOR THE MINING INDUSTRY



"The SYMONS PROCESS of CRUSHING"

as revealed by the camera

'Tis said that "the proof of the pudding is in the eating." The proof in a Crusher, however, is in its ability to continually produce large quantities of desired product economically. That such has been proven by the SYMONS CONE CRUSHER is evidenced by the thousands of Standard and Short Head SYMONS CONES which have been installed throughout the world wherever fine reduction crushing is being done.

The enormous capacity of the SYMONS CONE CRUSHER is made possible by the remarkably simple SYMONS PROCESS OF CRUSHING which is revealed in the accompanying views through the camera's eye. To record the film, a Standard type CONE CRUSHER was sectionalized to expose the crushing cavity.

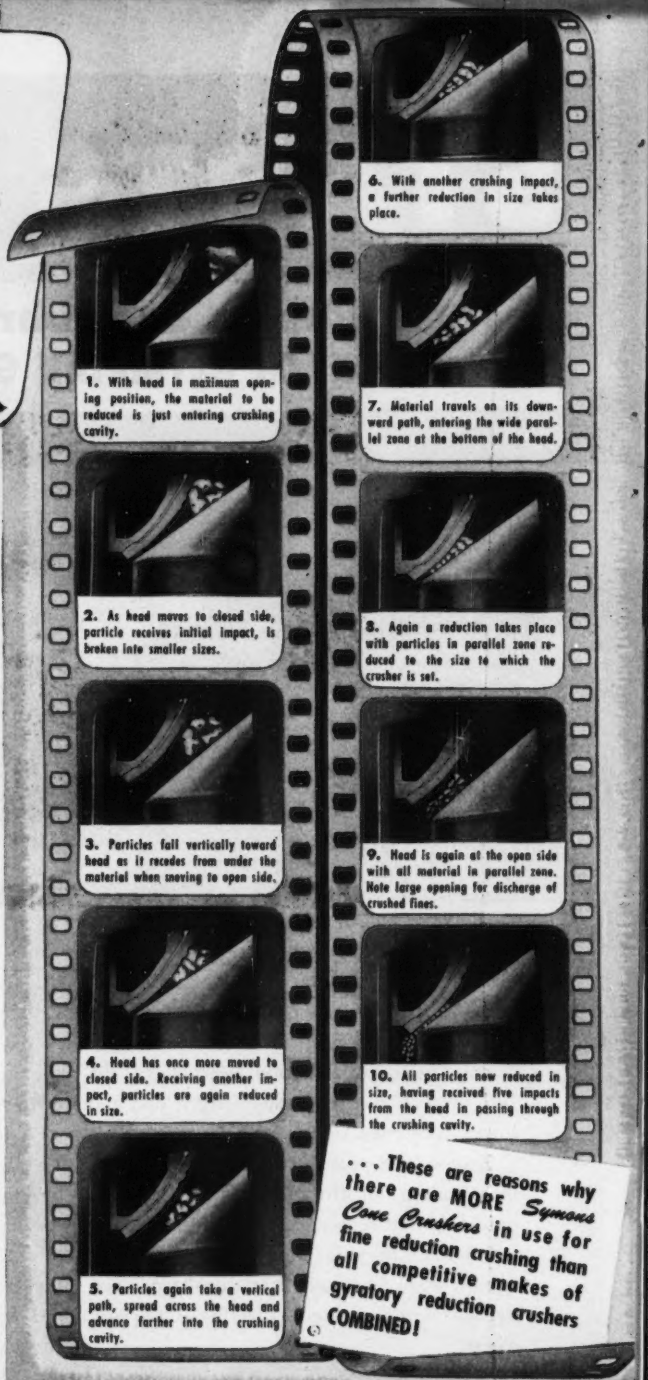
Although the SYMONS CONE is classified as of the "gyratory" type, the principle of crushing differs radically from that of the conventional gyratory since the head or cone in the SYMONS CRUSHER travels at least five times as far and gyrates much faster than in the ordinary gyratory type of crusher.

The material, in its passage through the crushing cavity in the SYMONS CONE, is controlled and timed to receive a series of rapid hammer-like blows before it is discharged.

The crushing action in the SYMONS CONE is a combination of controlled feed, high speed, timing, and extraordinarily large discharge capacity. These factors, coupled with the spring release safety feature of being able to pass uncrushable items—such as tramp iron, etc.—constitute ample proof of the superiority of the SYMONS CONE and the SYMONS PROCESS OF CRUSHING.

The camera reveals that from the time the material enters the crushing cavity until it is discharged, it passes through a successive series of crushing stages with a minimum of abrasion, sliding, or frictional wear—the entire process being one of smashing impact, resulting in maximum reduction.

C151


1. With head in maximum opening position, the material to be reduced is just entering crushing cavity.
2. As head moves to closed side, particle receives initial impact, is broken into smaller sizes.
3. Particles fall vertically toward head as it recedes from under the material when moving to open side.
4. Head has once more moved to closed side. Receiving another impact, particles are again reduced in size.
5. Particles again take a vertical path, spread across the head and advance farther into the crushing cavity.
6. With another crushing impact, a further reduction in size takes place.
7. Material travels on its downward path, entering the wide parallel zone at the bottom of the head.
8. Again a reduction takes place with particles in parallel zone reduced to the size to which the crusher is set.
9. Head is again at the open side with all material in parallel zone. Note large opening for discharge of crushed fines.
10. All particles now reduced in size, having received five impacts from the head in passing through the crushing cavity.

. . . These are reasons why there are MORE *Symons Cone Crushers* in use for fine reduction crushing than all competitive makes of gyratory reduction crushers COMBINED!

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NORDBERG

Machinery for processing ores and industrial minerals

As the white outline indicates, a standard unit of much greater frame size would be required to do the work of Speedaire.

SPEEDAIRE delivers, rain or shine

OPERATING outdoors in all kinds of weather, protected only by a piece of sheet iron, this Speedaire drives a reciprocating feeder that empties refuse material from the storage bin above it into dump cars.

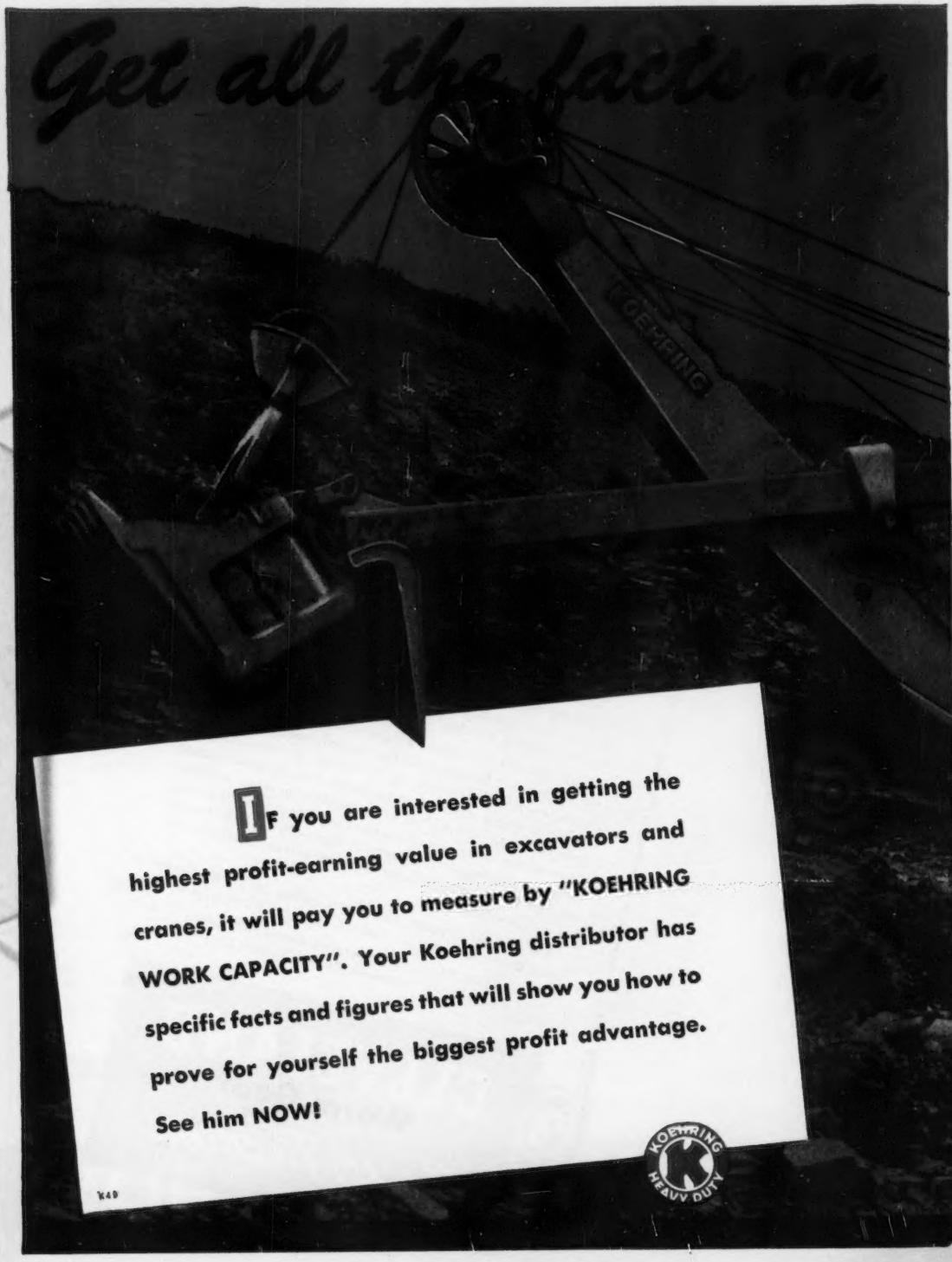
Three compelling reasons led the company to install Speedaire instead of a conventional worm gear reducer: Speedaire weighed 30% less—it required 26% less headroom—it saved $50.50.

Speedaire is Cleveland's new fan-cooled worm-gear speed reducer. Because it is fan-cooled, Speedaire will do more work—will deliver up to *double the horsepower* of standard worm units of equal frame size, at usual motor speeds. It can be installed economically on many applications where other types have been used heretofore—giving you the advantages of a compact right-angle drive. Speedaire gives the same long, trouble-free service characteristic of all Clevelands.

For full description, send for Catalog 300. The Cleveland Worm & Gear Co., 3281 E. 80th St., Cleveland 4, O.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers Limited.

CLEVELAND Worm Gear Speed Reducers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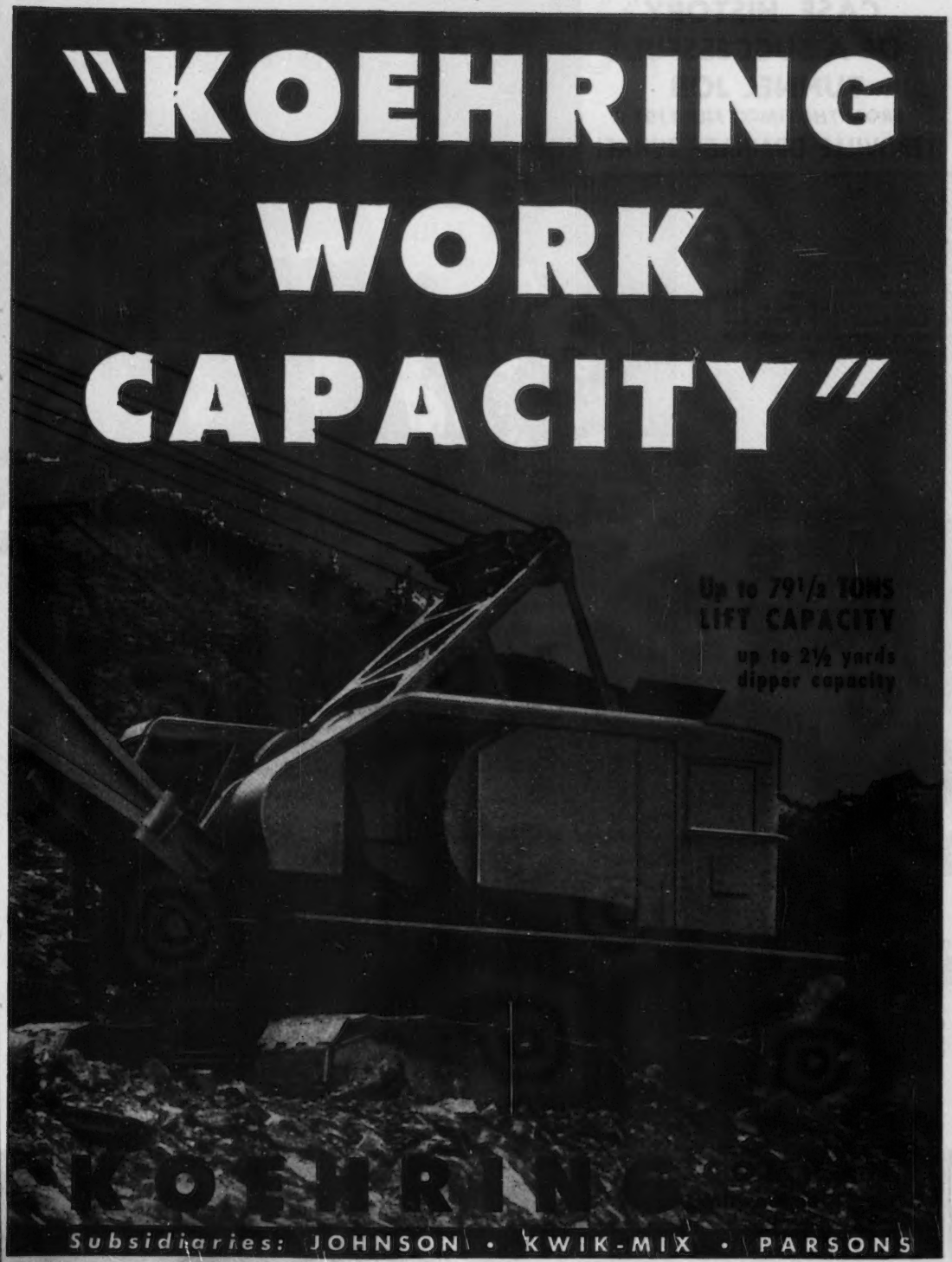
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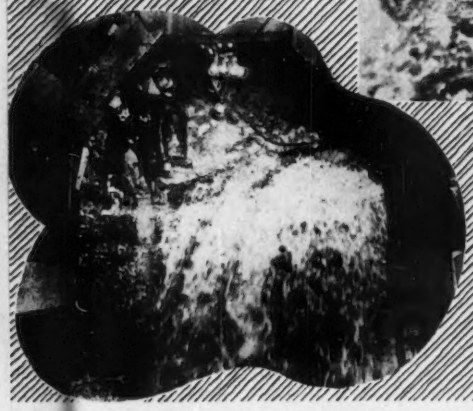
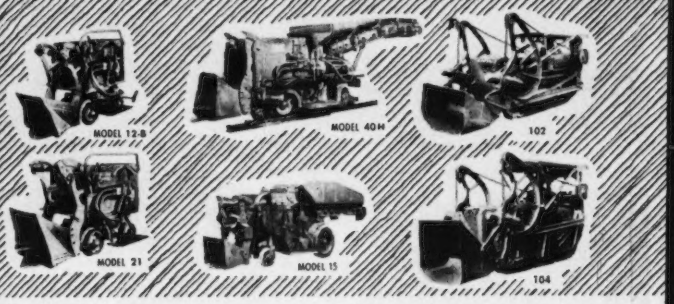
CASE HISTORY OF A SUCCESSFUL TUNNEL JOB

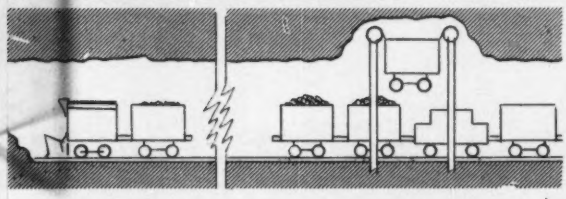
FROM THE EIMCO FILE T101

LEADVILLE DRAINAGE TUNNEL

Proposed tunnel length, 17,300; Length completed at end of war, 6,600; Tunnel size, 9' x 10'6"; Supported section, 64% of length; Rock section, 36% of length.







"Cherry Picker" method of car switching was used in the Leadville Tunnel. The frame was erected to lift the empty above the train of loads moving out, then lowered to be moved to the face for loading.

Equipment used for rock loading on contract jobs must be well built, proved, heavy-duty equipment—capable of standing up to the most difficult—most unexpected operating conditions.

Tunnels are carefully surveyed before they are started. Test holes are drilled from the surface at selected spots along the tunnel line to determine the ground structure through which the tunnel is to be driven, but even then, as in the Leadville Drainage tunnel, there are unseen glacial channels and faults which make progress slow and dangerous.

Loading in the Leadville Tunnel was done with Eimco Model 21 RockerShovels. These machines were subjected to the most severe operating conditions working in water at 37° temperature with an average flow of 3000 to 7000 gallons per minute.

EIMCO

240

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The World's Largest Manufacturers of Underground Rock Loading Machines

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A MESSAGE TO AMERICAN INDUSTRY

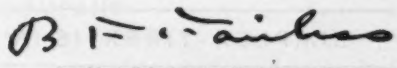
"This is more than a shortage . . . this is an emergency.

Every pound of your scrap is needed, NOW !"

"THE STEEL INDUSTRY is currently operating at more than 100% of rated capacity—turning out well over 2 million tons of steel per week. This record high production—every ton of which is in urgent demand—cannot be kept up unless we get more scrap from every potential source. For without your scrap we cannot produce enough steel. Today, every ton of steel turned out requires a half a ton of scrap for its production. That's why scrap—more scrap—is so urgently needed, and needed right away.

"The fact we have to face today is that steel mills are operating on a hand-to-mouth basis as far as scrap is concerned. Some mills are working on only a two-day supply of scrap. We already have had to shut down steel-making furnaces for lack of scrap.

"That's why we are asking you to strain every effort to get more scrap out of your plants and yards and on its way to the mills . . . to search out the scrap that doesn't come to market in normal times. You'll find this "dormant" scrap in obsolete equipment, tools and machinery that you haven't used for years . . . overlooked in your storage sheds . . . or rusting away in a junk pile in some forgotten corner. It's there. Turn it in at once—*so we can turn out the steel you need.* We can't do it without your help."



President, United States Steel Corporation

USS

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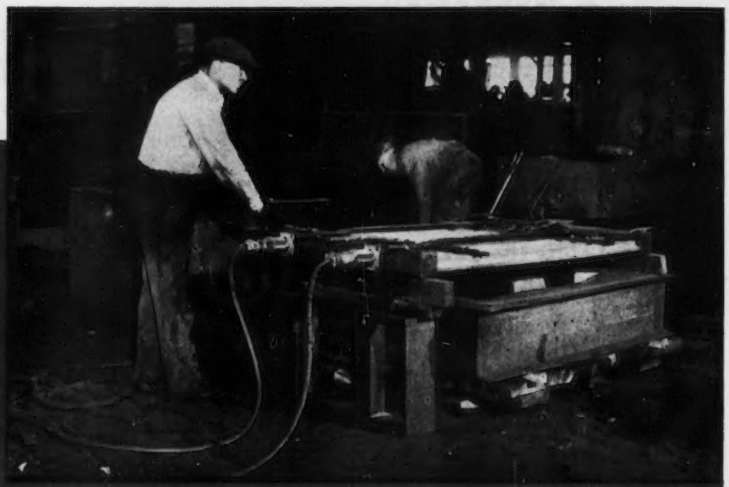
UNITED STATES STEEL



TIREX HELPS

TAKE THE BUBBLES OUT OF STEEL CASTINGS

Foundries "skin dry" molds so that the molding sand will not give off a gas and cause bubbles or porosity in the casting.

Until a short time ago it was common practice in most foundries to skin dry molds with an open kerosene torch. It was slow, hot, dirty, disagreeable work and a moment's inattention could result in a burned and spoiled mold.

A Milwaukee foundry decided to get rid of this dirty, slow job of skin drying molds. They had infrared ray heaters developed. These heaters not only did away with the drudgery of the job but gave the foundry several unexpected dividends. First, the labor of the man drying the mold was eliminated. Second, spoiled molds became a thing of the past. But better still, because the infrared ray heaters were faster than the open kerosene torches, it was possible to dry an additional mold each day and that is a considerable dividend.

Of course the infrared ray heaters demanded a dependable pathway for power and that they got in TIREX Cables. This picture shows TIREX Cables connected to the heaters. TIREX not only operates dependably day in and day out but it safely combats the sharp abrasive foundry sand, it eliminates the danger from cable fires caused by flying molten metal sparks, and it takes in its stride the everyday abuse that is part of the job.

Isn't that the kind of service that you want from your portable cords or cables? Of course it is! This kind of service was deliberately built into TIREX Cords and Cables. They are a product of Simplex research.

Simplex research gave you the first heavy duty, rubber-jacketed portable cord or cable; the first low water absorption insulation; the first rubber-jacketed underground cable. Besides these notable "Firsts" Simplex research has provided a great many developments which have enriched the art of cable design.

SIMPLEX-TIREX IS A PRODUCT OF SIMPLEX RESEARCH

SIMPLEX-TIREX

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The STAR PERFORMER on tough jobs!

Your Northwest is a real Rock Shovel! It is designed as a Rock Shovel and it has a combination of advantages for *rock digging* that no other shovel has!

The Northwest Dual Independent Crowd utilizes force most other independent Crowd Shovels waste—result, it handles harder digging and more yards per hour.

The Northwest Welded Boom design is based on scientific tests, combined with the results of performance in the field, not on theory. The Cushion Clutch eliminates shock overloads to all parts under power before damage can occur. Uniform Pressure Swing Clutches take the jerks out of swinging and the "Feather-Touch" Clutch Control takes the back-breaking effort out of operation.

Your Northwest is a Star on the tough jobs—or any job. Where other equipment may be known as "A Good Crane," "A Good Dragline," "A Good Shovel or Pullshovel," Northwest is universally recognized as a leader whether operating as a Shovel, Crane, Dragline or Pullshovel.

You can't have Northwest advantages unless you have a Northwest.

SHOVEL, CRANE, DRAGLINE, PULLSHOVEL OR TRUCK CRANE

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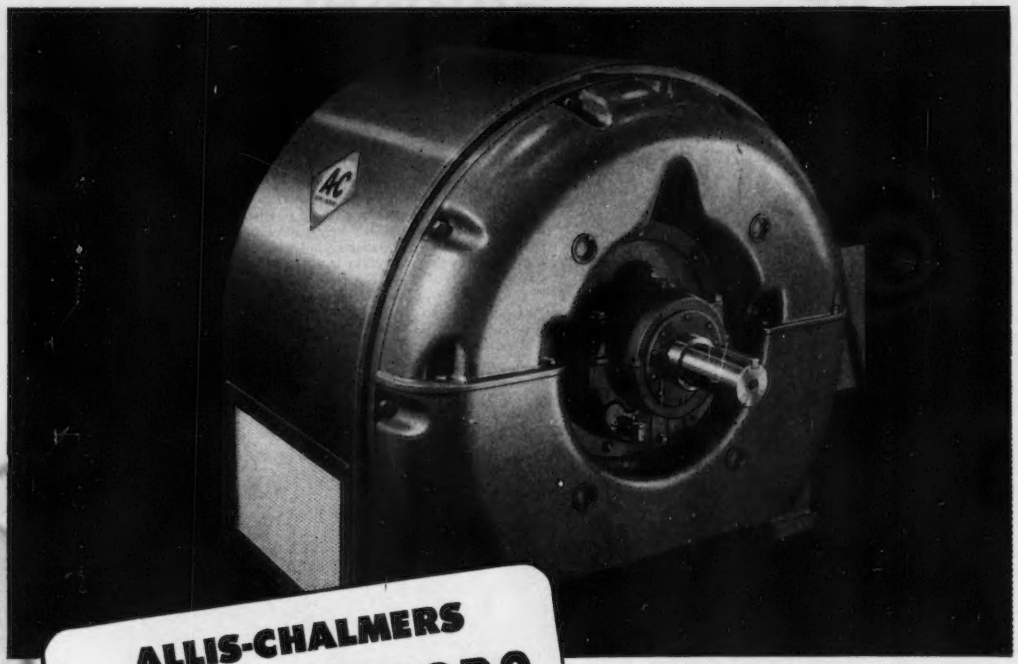
Convertible for any Mining Material Handling or Excavation Problem



ALLIS-CHALMERS LARGE MOTORS ... Combine Protection & Accessibility

MAINTENANCE COSTS are dealt a double blow by this new line of Allis-Chalmers squirrel-cage induction motors. First, its protective design features minimize the need for maintenance operations. Then, its planned accessibility cuts the cost of doing the maintenance work.

How Maintenance is Reduced

In these motors, protection begins with drip-proof construction. But it does not end there. Air discharge openings in the stator yoke are given the added protection of removable louvered panels. Air intakes in the rigid cast iron end shields are located so as to prevent injury to the windings by mishandled tools or other objects. Capsule-type bearing housings protect the bearings and oil supply when the windings are being cleaned. The capsules can remain sealed against abrasive dirt throughout the cleaning operation.

How Costs Are Cut

This added protection has been achieved without sacrificing accessibility. One man can perform all routine maintenance operations. To check the air gap he simply removes a few screw-type plugs from the bearing end shields.

For cleaning, he removes the upper halves of the end shields and reaches right inside the motor with his vacuum cleaner or air hose. And there is plenty of room to reach up back of the stator core through the air discharge openings in the sides of the yoke.

Wide Range of Sizes

These modern-design drip-proof (or splash-proof) cage motors are built in sizes from 60 hp at 300 rpm to 2000 hp at 1800 rpm. Ask your Allis-Chalmers representative to show you the details of this exceptional new motor, or write Allis-Chalmers, Milwaukee 1, Wisconsin, for bulletin 05B7542.

A-3409

ALLIS-CHALMERS

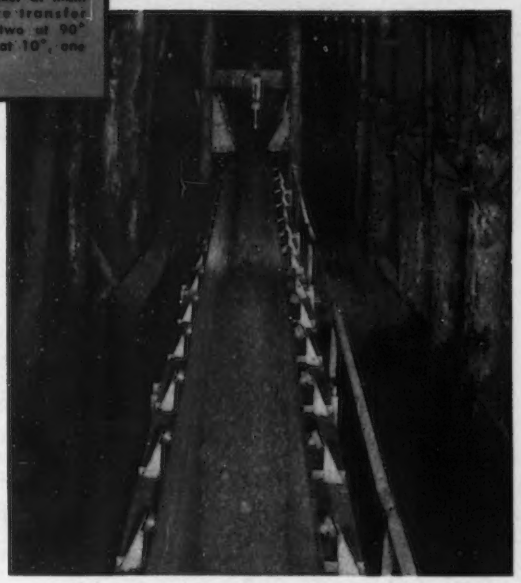
Goodman BELT CONVEYORS

The Type 99

Built For Moving Heavy Ore At High Speed

The Goodman Type 99 is not a light duty conveyor with strengthened members, but a unit of rugged construction with all sections designed for heavy duty service.

Iron ore transported by six belt conveyor flights from car discharge point to skip pocket at main shaft. Five transfer points — two at 90° turns, two at 10°, one in line.



Here are some of the reasons why the Type 99 has "paid its own way":

EASILY INSTALLED AND EXTENDED WITH MINIMUM OF SUPERVISION — Choice of solid or knockdown style of construction of intermediate sections. Knockdown style particularly adaptable to moving and assembly in narrow metal mine drifts. Compact design of head and tail sections allows maximum head and side clearance. Intermediate section parts jig manufactured for interchangeability, ease of assembly and compact storage.

ACCURATE ALIGNMENT — Design of intermediate framing and method of assembly assure lateral alignment and rigidity without loss of vertical flexibility on uneven floor.

NO ANCHORS REQUIRED — No need to anchor head or tail ends to maintain belt tension. Compression forces caused by belt tensioning are taken up by patented arc butt end joints in side channels.

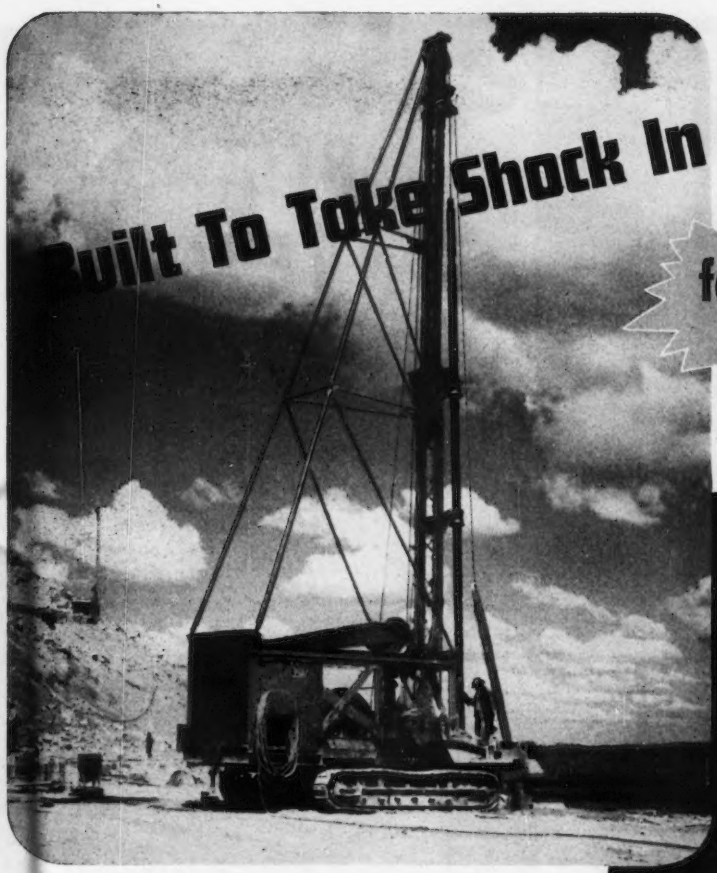
COMPLETE ELECTRICAL UNITS — Motors of suitable horsepower are available. Control systems including sequence control, belt slippage protection, emergency switches, load limit switches, brakes and automatic loading points are also obtainable.

Goodman belt conveyors today are profitably moving iron ore, copper ore, potash and coal. Perhaps they will help cut costs at your mine. Your inquiry is invited.

Goodman MANUFACTURING COMPANY

HALSTED STREET at 48th • CHICAGO 9, ILLINOIS

CUTTING MACHINES • CONVEYORS • LOADERS • SHUTTLE CARS • LOCOMOTIVES



Built To Take Shock In Stride...

for faster drilling, longer life

A Complete Line

22-T	$5\frac{5}{8}$ to $6\frac{5}{8}$ in. holes
27-T	6 to $6\frac{5}{8}$ in. holes
29-T	6 to 9 in. holes
42-T	9 to 12 in. holes

BUCYRUS ERIE

Bucyrus-Erie shock-capacity starts at the top of the rig. Tough rubber discs that provide a ramrod drilling punch also take shocks out before they can get in. Rubber insulates the spudding beam and heel sheaves, as well as the tool guide... further dampening vibration. Derrick and draw works are supported by an all-steel, all-welded box-type frame that insures perfect alignment, low maintenance and long life.

Team up these construction advantages with Bucyrus-Erie's super-shattering drill action, easy control and full-length caterpillar mounting—and you've got the most productive, the most dependable rig in the field. See your nearby Bucyrus-Erie distributor for all the facts.

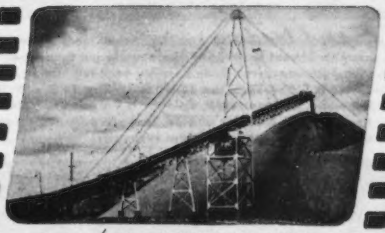
42851

BUCYRUS-ERIE · South Milwaukee, Wisconsin

High tonnage – low cost

Conveyor Belt System Makes Gold Mine "Pay"

Shovel and Diesel dragline feed ore through grizzly to 60" pendulum conveyor loading to portable crusher at start of 9-belt conveyor system.



Crushed gravel is stock-piled by 700-foot conveyor suspended from tower.

Reclaim tunnel (left) feeds conveyor to washing plant housing jigs, tables, amalgamators and grinders, and classifying units.

Boom stacker transfers sands from washing plant to waste pile.

OUTSTANDING mining operation in the western states, this gold mine has been handling up to 17,000 tons per day of porphyry gold since January 1950—all over a conveyor belt system belted according to the recommendations of the G. T. M.—Goodyear Technical Man.

Secret of the mine's success is the trouble-free performance of its 9-belt system, belted with Goodyear Style B conveyor belting—designed to handle highly abrasive materials. If you have a bulk-load handling problem, it will pay you to consult the G. T. M. for conveyorization recommendations. See your nearest distributor of Goodyear Industrial Rubber Products, or write Goodyear, Akron 16, Ohio.

GOODYEAR INDUSTRIAL RUBBER PRODUCTS
GIP - Specified STYLE B CONVEYOR BELT
for HANDLING ABRASIVE MATERIALS
A
Tough cover resists abrasion and gouging
B
Multi-plies of highest grade duck, frictioned with 16-19 pound stock for added flex-life
C
Breaker strip gives further protection to carcass and resists cover stripping

FOR HOSE, FLAT BELTS, V-BELTS, MOLDED GOODS, PACKING, TANK LINING, RUBBER-COVERED ROLLS built to the world's highest standard of quality, phone your nearest Goodyear Industrial Rubber Products Distributor.

GOODYEAR

THE GREATEST NAME IN RUBBER

Increase PRODUCTION . . .

Hauling overburden at New Tazewell, Tenn. quarry

1 ***Haul anywhere*** . . . Tournarocker is a new kind of haul unit built from the ground up for "off-road" hauling. It safely travels mountain trails and cross-country as well as highways and city streets. It hauls capacity loads over any kind of terrain. And, it stands up to tough, rough hauling work on steep grades with minimum maintenance. Optional Electroterder provides added braking action for safety on steep grades.

2 ***Speed loading*** . . . Big, wide "target" areas make it easy for shovel or dragline operators to get faster loading cycles with Tournarockers. Body opening on 9-ton size is 7′ x 11′, on 18-ton is 9½′ x 12½′, on 35-ton is 10′2″ x 17′2″. Width is most important because radial distance is hard for operator to judge. Rear of body provides a wide, low entry for the dipper to give extra speed advantage for the excavator.

Dumping sandstone near New Haven, Conn.

Construction Wash.

5 ***Reduce time dumping*** . . . a touch of electric switch on operator's panel activates hoist motor . . . means a fast, safe dump. Independent brakes on front and rear allow operator to safely back to edge of fill . . . lock rear wheels and dump over edge . . . yet keep prime mover in forward gear for safety and fast getaway. There is no delay for hydraulic pressure to build up, no slow jacking up by hydraulic pumps. Loads fall free and FAST!

6 ***Cleans load every time*** . . . even in mud and sticky clay, Tournarocker dumps clean. The streamlined body sheds material readily . . . body can be raised to vertical position to clear load . . . no material rides back to the excavator to steal pay-load room on next trip. Large boulders or oversize rock easily clear and can safely be dumped over edge of fill. Rocks cannot roll forward against wheels nor can material pile under rear end.

Stripping quarry rock near Phoenix, Ariz.

Stripping coal mine at Mt. Carmel, Pa.

9 ***Cut maintenance troubles*** . . . because Tournarocker has no hydraulic lift complications, no high pressure jack lines to keep tight, no long drive-shafts to rear-wheel drive, the most common maintenance problems of rear-dump haul units are eliminated. Owners in all parts of the world are reporting exceptionally high mechanical efficiency and low maintenance costs handling heavy rock and ore with Tournarockers.

10 ***Improved safety*** . . . low center of gravity, good clearance, high visibility, front-wheel drive, 90° power steer, giant tires, big 4-wheel air brakes, push-button electric control, big comfortable air foam cushion seat, high maneuverability . . . all these features combine to make this rear-dump hauler an important asset for safety. This permits fast hauling, saves time on dump, and makes it easier to train new operators.

LETOURNEAU PEORIA, ILLINOIS *TOURNAROCKERS*

TRACTIO ADVANTAGES of A CRAWLER PLUS HIGH-SPEED on RUBBER

Simplify JOB MANAGEMENT

Road construction between Nacozari and Toscata, Mexico

Mountainside road relocation near Wenatchee, Wash.

3 ***Cut spotting delays*** . . . You need fewer "spots" with these BIG haul units, and, because of their big tops, it is easier and quicker to put them under the dipper. The prime mover can pivot at right angles to the body providing a 90° angle for prime mover wheels. That saves time at every spot. Operator can back in fast because he has positive power steer and can stop instantly with air-operated multi-disc air brakes.

4 ***Work fast in tight quarters*** . . . positive power steer, 90° turns, electric controls, multi-disc air brakes that have more braking surface on a single wheel than most haul units have on all four wheels . . . all contribute to fast handling over steep, narrow, winding pit roads. Giant tires roll easily over rough surfaces, steer easily out of ruts, give operator confidence under the most difficult hauling conditions.

Hauling rock overburden

Hauling clay for Paisley Ohio cement plant

7 ***Save dump cleaning*** . . . giant tires, big, four-wheel, multi-disc air brakes, powerful front-wheel drive, plus the rocker dumping action, make it easy for the Tournarocker operator to dump his entire load cleanly and safely over the bank even on a soft fill. This reduces time and expense of dump clean-up, provides continuous free dump area along entire fill, eliminates dumping delays and speeds up haul cycles.

8 ***Cut weather delays*** . . . Tournarockers keep hauling even when crawlers can't get through! Giant tires, 2' wide and over 7' diameter, give ample flotation for soft going. When a wheel slips, Tournamatic differential applies 4 times the pull to wheel on firmest footing. Independent power steer turns prime mover to seek new footing for better traction to pull out of mud holes. Job records prove these all-weather features.

Railroad relocation near Umatilla, Ore.

Building dam northern Alga

11 ***Operator comfort*** . . . from an employee relationship standpoint, as well as safety, Tournarocker is an asset to your organization. The big air foam cushion seat eliminates "bounce" . . . no "up and down" ride on these Tournarockers. Pushbuttons on the instrument panel actuate electric motors that eliminate all manual work of steering. Fatigue factors are greatly reduced on Tournarockers. This means increased production for you.

12 ***Insure future earnings*** . . . Behind the Tournarocker prime mover, you easily interchange Carryall scrapers, bottom-dump haulers, cranes, flat-bed trailers. This gives you a plus in insurance of steady earnings in any season and any time. And, any additional trailing unit is available anytime at only approximately 25% of the initial cost! Bulldozer blade or snow plow can also be added on the small "D" for extra profits.

Mail today to: R. G. LeTOURNEAU, INC., Peoria, Illinois

NAME..... TITLE.....

COMPANY.....

STREET.....

CITY..... STATE.....

Type of work.....

- ☐ Send us more information
- ☐ Have Distributor call regarding:
- ☐ 9-ton, 28 m.p.h. Tournarocker
- ☐ 18-ton, 35 m.p.h. Tournarocker
- ☐ 35-ton or 50-ton Tournarocker

LETOURNEAU LET EQUIPMENT

You get *DOUBLE DUTY

JOY TELESCOPIC FEED STOPERS

The S-91T provides a steel change of 36", compared with the 18" change of conventional stopers. In most mining conditions, this long feed will give more drilling time, with fewer steel changes and fewer lengths to stock.

At left, the Joy S-91T Stoper in operation; above, with telescopic feed leg retracted; right, with leg extended, giving a 36" drilling feed. Another feature, instant, "thumb-flip" rotation release, provides safety and easy spotting of holes.

JOY HAND-HELD DRILLS

A complete line of well-balanced, compact drills, ranging from 27 to 67 lbs. in weight.

The L-57 and L-67 Joy Hand-Held Drills are also available with mounting brackets for use as light drifters, or for wagon drill mounting.

Joy Jibs are hydraulically controlled booms for drill mounting on Jumbos, or on rubber-tired, self-propelled Drillmobiles.

JOY HYDRO DRILL JIB

Air-hydraulic control of all jib movements eliminates heavy lifting, and permits more accurate hole spotting for more efficient use of powder and controlled breakage.

1851—1951—100 YEARS OF ENGINEERING LEADERSHIP

with JOY DUAL-VALVE SILVER STREAK DRILLS

*Maximum Footage–Maximum Economy

In tunnels, crosscuts, drifts, or stopes, Joy *Silver Streak* Rock Drills with the DUAL VALVE will do your drilling job faster, and use less air with lower maintenance. Here's why—

(1) The exclusive DUAL VALVE, a feature of all Joy rock drills, makes air do more work. By admitting the correct amount of air behind the piston and excluding air ahead of it during the drilling stroke, maximum force is exerted on the drill steel. There's no cushion of air ahead of the piston to reduce the force of the blow. Then the rear section of the Dual Valve meters the correct amount of air ahead of the piston to force it back with a "snappy" rotating action. This adds up to more power-packed strokes per minute, for faster drilling with less air.

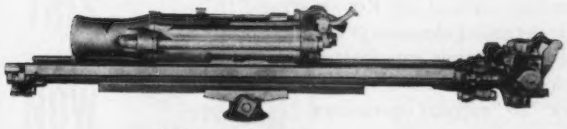
(2) The silver-like cadmium plating on Joy *Silver Streak* Rock Drills aids lubrication while running-in, protects parts from rust while in stock, and keeps maintenance costs at a minimum.

The Joy line is complete. There's a *Silver Streak* rock drill for every rock breaking need. Shown here are drifters, stopers, hand-held drills, Hydro Drill Jibs. To complete the line, there are wagon drills; the QB-20 for line drilling and dimension stone quarries; rubber-tired, self-propelled Drillmobiles; and specially mounted drills for special needs.

● *Let our Field Men work with you.*

JOY DUAL VALVE

"Makes Air do More Work"



JOY DRIFTERS

For column mounting, as at right, or for use on mobile jumbo units, Joy Drifters are built in three sizes—all with fast, powerful Dual Valve action. Efficient Pistonmotor Feed, with only two moving parts, provides strong, steady advancement and retraction. One-piece locking chuck increases bearing area and reduces wear on lock ring and chuck bushing.

Consult a Joy Engineer

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

Low costs and no complaints on this midtown excavation-and-tunnel with **ROCKMASTER** blasting!

Excavation under way for new Cain-Sloan Co. department store at Nashville, Tenn. Oman Construction Co., contractors; Marr & Holman, architects.

Final stages of excavation. Entrance to utility tunnel in right hand corner.

Inside utility tunnel.

THE job called for blasting 35,000 cubic yards of solid rock in the heart of downtown Nashville, Tenn. Ordinary blasting methods would have required pecking away at the rock with small amounts of powder in a few holes at a time.

But the contractor used ROCKMASTER to speed the job! Result: More powder could be loaded into more holes for each shot—more rock was broken with each blast. Breakage was excellent. Valuable time and labor were saved in moving and placing protective mats. Normal traffic flow was maintained at all times; and there were no complaints about noise or vibration.

ROCKMASTER "16" may be the answer to *your* blasting problems—in the heart of town or 'way out in the open. Write for your free copy of the ROCKMASTER "16" booklet that shows how you can profit through the use of the correct numbers of the *sixteen* ROCKMASTER milli-second delay electric blasting caps teamed with the ROCKMASTER system of explosive choice and loading methods. Our technicians will be glad to assist you in applying ROCKMASTER "16" to your operations.

ROCKMASTER: Reg. U. S. Pat. Off.

ATLAS EXPLOSIVES *"Everything for Blasting"*

CHEMICALS ATLAS EXPLOSIVES

ATLAS POWDER COMPANY, Wilmington, Del. • *Offices in principal cities* • *Cable Address—Atpowco*

Mechanical soldiers need good shoes, too!

THESE are days of grave concerns . . . of conservation and mobilization for strengthening the nation's defense—for the survival of our national economy—for the continuance of maximum production effort in the metallic and non-metallic mining programs—for the keeping of every home-front machine in condition to stay on the job until its replacement again becomes a normal procedure.

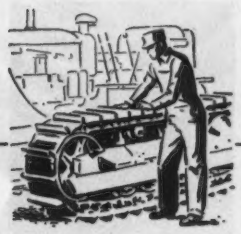
That includes *your* equipment and emphasizes *your* responsibilities. To benefit fully from the productive life that has been built into your "Caterpillar" equipment, you must be alert to its needs as time and hard usage take their toll in wear and depreciation. For instance:

How are your "Caterpillar" track shoes?

Tough as they are, they can't battle rocks, shale, jolts and grinds forever. Growing shortages in the premium steels that go into them may make early replacements difficult—and extra care of track parts something to think about.

CATERPILLAR, PEORIA, ILLINOIS

DO THIS NOW



YOU'RE THE DOCTOR. Check those sprockets, grousers, rollers, idlers, pins, links and bushings. Proper track adjustment minimizes wear. Sprockets may need switching from side to side, and pins and bushings need turning, to provide new wearing surfaces. Shoes serve longer if you have worn grousers built up before excessive wear occurs.

Reread your Operator's Instruction Book. Anticipate your future parts requirements. Take the facts to your "Caterpillar" dealer. His modern facilities and skilled servicemen are at your disposal. He can rebuild many parts to keep your machines on the job. Their added life will repay the reconditioning cost over and over.

CATERPILLAR

REG. U. S. PAT. OFF.

DIESEL ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT

WESTINGHOUSE
Life-Linestarter
DO NOT LUBRICATE
Life-Linestarter
PAIRED FOR PRODUCTION
Life-Line motor

STOP costly down time with this pair

"Down-time minutes" can mean a loss of hundreds of units or thousands of dollars. Here's a production team—the best defense against down time—Life-Line motors and Life-Linestarters®. They're paired for production.

Advanced design of these two has eliminated common troubles. Look at the features that make it possible:

Life-Line motor

Steel frame... adds strength, cuts weight.

Pre-lubricated bearings... no greasing.

Improved windings... protected by tough Thermoset varnish, add electrical life.

Life-Linestarter

Bimetallic disc... calibration unaffected by aging or oxidation.

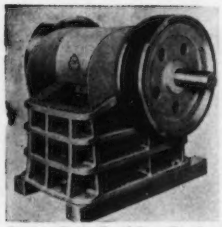
Servicing is simple... all parts front removable.

Screw driver only tool required.

Get these two dependable performers—paired for production—and stop costly down time. For complete information, ask your Westinghouse representative for "Life-Line Motor Book", B-3842 and "Tomorrow's Starter Today", B-4677, or write direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21639

YOU CAN BE SURE... IF IT'S Westinghouse

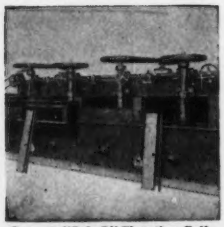
Life-Line MOTORS and CONTROLS



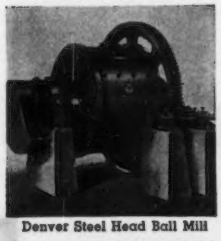
Denver Force Feed Jaw Crusher

Denver Mineral Jig

Denver Cross-Flow Classifier



Denver "Sub-A" Flotation Cells



Denver Steel Head Ball Mill

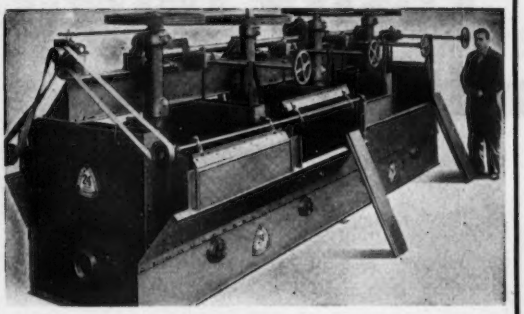
Denver Disc Filter

Denver-Dillon Vibrating Screen, Floor Mounted Type Shown

Continuous tests can be conducted at low cost.

Denver "Sub-A" Flotation

...Standard The World Over



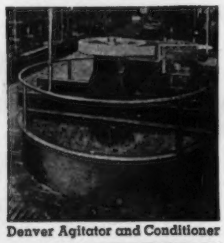
Adjustable Spitzkasten ... Latest design permits overflow of froth at high or low levels with the possibility of roughing with a shallower tank but cleaning with the more efficient deeper cell ... all in the same machine.

Improved Aeration ... Air and/or gas may be admitted at two points. Multi-bladed impellers are available for super-aeration-agitation. Bowl type diffuser liners improve metallurgy in some cases.

Flexible Tank Structure ... Straight sides or spitzkasten ... single overflow or double ... cell to cell tank division or open flow ... are easy to make changes on most sizes.

No Major Change, but Constant Improvement ... Latest design improvements can be adapted to the oldest Denver "Sub-A." Denver machines don't go out of date. Get details in Denver "Sub-A" Flotation Bulletin No. F10-B50.

Send for your free copy if you do not have one.



Denver Agitator and Conditioner

Denver Low-Head Thickener With Denver Diaphragm Pumps

Denver Adjustable Stroke Diaphragm Pump

Denver Vertical Centrifugal Sand Pump

"The firm that makes its friends happier, healthier and wealthier"

DENVER EQUIPMENT COMPANY

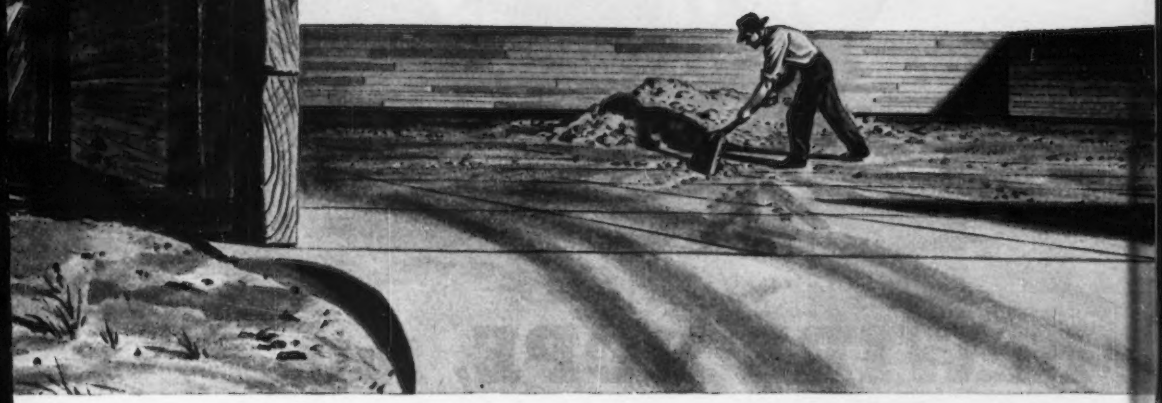
P. O. BOX 5268 • DENVER 17, COLORADO

DENVER • NEW YORK CITY • CHICAGO • TORONTO • VANCOUVER • MEXICO CITY • LONDON • JOHANNESBURG • RICHMOND, AUSTRALIA

SEVEN SOLUTIONS

TO THE

Sulfur Shortage



Since sulfuric acid is vital to almost every industry, the current shortage of elemental sulfur, from which this acid is generally derived, is a serious matter and has a world-wide effect. Waste materials that can be converted into sulfuric acid and unworked sulfur bearing ores hold the answer to the sulfur shortage. Chemico offers proven processes for utilizing such sources of sulfur. If you have a source, in commercial quantities, of any of the following materials, please give us details. We will then be glad to make specific recommendations without obligation.

WASTE MATERIALS

1. Spent Alkylation Acid, a refinery by-product in the manufacture of high octane gasoline, can be regenerated into fresh sulfuric acid of any desired strength.

2. Oil Refinery Sludge is another refinery by-product resulting from the treatment of petroleum fractions. The acid content is recovered as fresh acid of high strength.

3. Waste Iron Sulfate-Acid Solutions are by-products from steel mills and titanium pigment manufacturing plants. The sulfuric acid is concentrated for re-use and the iron sulfate converted to fresh sulfuric acid.

4. Smelter Gas results from metallurgical operations where sulfide ores are roasted preliminary to the recovery of metals. The gas is cleaned and processed into fresh sulfuric acid.

5. Coke Oven, Natural and Refinery Gases contain sulfur as hydrogen sulfide. This may be reduced to sulfur or extracted directly as a raw material for producing sulfuric acid.

SULFUR BEARING ORES

6. Pyrites and other metal sulfides are roasted to produce sulfur dioxide gas which is then converted into sulfuric acid.

7. Low-grade Surface Deposits containing sulfur in elemental form are treated by a new and economically sound process which recovers the high quality sulfur necessary for modern contact plant operation.

Chemico offers 37 years of experience in the design and construction of efficient plants for the manufacture of sulfuric acid and other heavy chemicals . . . on a one-contract, one-responsibility, performance-guaranteed basis.

CHEMICAL CONSTRUCTION CORPORATION

CONSULTING, DESIGNING AND CONTRACTING ENGINEERS

488 MADISON AVENUE, NEW YORK 22, NEW YORK

EUROPEAN TECHNICAL REPRESENTATIVE

CYANAMID PRODUCTS, LTD., LONDON W.C.2, ENGLAND • CABLES: CHEMICONST, NEW YORK

Chemico plants are profitable investments

CC-551

in WIRE ROPE, too

It's all in the RIGHT KIND of Muscle

The powerful, rugged muscles of a charging rhino enable him to propel his tremendous bulk and weight at truly remarkable speed. Nature designed them well for the purpose they have to serve.

In wire rope, too, the right kind of muscle is vitally important... because different types of jobs present different types of destructive forces. Bending fatigue! Shock stress! Abrasion! Load strain! Each demands wire rope that best combines the required resistance characteristics.

Wickwire Rope gives you the benefit of long experience and specialized know-how which assures you of exactly the right kind of rope your particular job demands.

For additional information write or phone our nearest sales office.

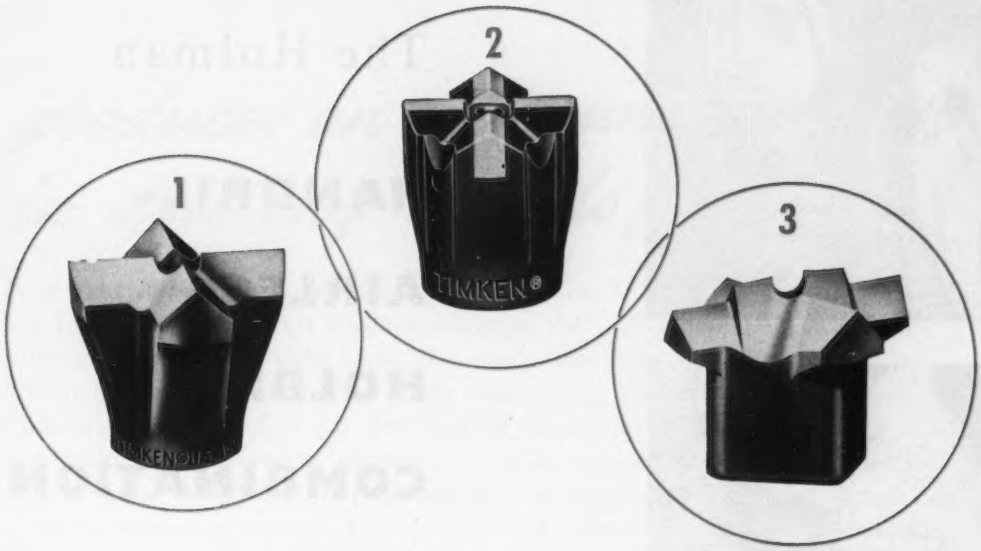
LOOK FOR THE YELLOW TRIANGLE ON THE REEL

EAST: WICKWIRE SPENCER STEEL DIV.—Boston • Buffalo • Chattanooga • Chicago • Detroit • Emlenton (Pa.) • Philadelphia • New York
WEST: THE COLORADO FUEL & IRON CORP.—Abilene (Tex.) • Denver • Houston • Odessa (Tex.) • Phoenix • Salt Lake City • Tulsa
PACIFIC COAST: THE CALIFORNIA WIRE CLOTH CORP.—Los Angeles • Oakland • Portland • San Francisco • Seattle • Spokane

WICKWIRE ROPE

CF&I PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL & IRON CORPORATION

Only the Timken Company offers all 3 rock bit types



and a complete Rock Bit Engineering Service!

WHAT do you want most from your rock bits—lowest bit cost per foot of hole, greatest possible drilling speed, or other advantages? Whatever it is, you can get it from the Timken Company, the only manufacturer who can offer you all three types of rock bits:

1. MULTI-USE—gives lowest cost per foot of hole when full increment of drill steel can be drilled and when control and reconditioning of bits are correct.

2. CARBIDE INSERT—extremely hard and abrasive ground. Drillers spend less time changing bits.

3. ONE-USE "SPIRALOCK"—for use where reconditioning is impractical or undesirable. Lowest unit cost. Has revolutionary new "Spiralock" union.

Because the Timken Company makes all three types, it is possible for our Rock Bit Engineering Service to make unbiased recommendations to meet your drilling needs. Backed by more than 17 years of experience, it is the world's largest rock bit field organization.

FREE BOOKLET! Shows and describes full line of bits. A helpful guide to rock bit purchasing. Write on your company letterhead to The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

your best bet for the best bit
...for every job

Pioneers in Canada —

The Holman

HANDRIL-

AIRLEG-

HOLBIT

COMBINATION

S.L.200. A recent Handril with exceptionally powerful rotation. With Airleg and Holbits gives high speeds in hard rock. Automatic lubrication. Weight 50 lb.

SILVER BULLET. Widely favoured for use with the Airleg, this general purpose Handril is suitable for really hard formations. Automatic lubrication. Weight 58¼ lb.

produces an all-round increase in drilling speeds!

Now widely used in mines throughout the world, the Holman COMBINATION first saw active service in Canada in October 1947. No mining engineer who witnessed those first try-outs had any doubt that here was a revolution in drilling technique. Events have shown them right. The Handril-Airleg-Holbit Combination is still first for performance anywhere in the world. It is a phenomenal labour-saver, a tremendous output booster. It all but eliminates steel changes. It will drill deep parallel holes in any direction, from any angle. It can be reset in an instant. Greatly improved control handle, still simple and reliable in construction but more easily operated.

CANADIAN HOLBIT. Tungsten Carbide Tipped with Wickaloy, 1¼" to 2".
CAMBORNE HOLBIT. Tungsten Carbide Tipped, cross and chisel, in various sizes from 1 ⅞" to 2" and in two grades of Tungsten Carbide.

Send for full technical data of this remarkable time and effort saving development. Expert advice will be gladly given on drilling in all formations, and demonstrations arranged by appointment.

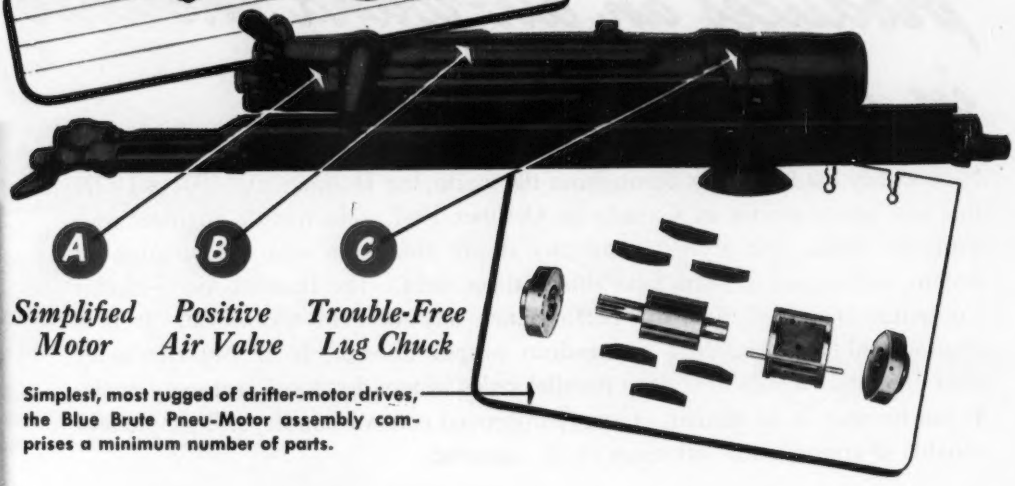
BROS. LTD.
Holman
CAMBORNE . ENGLAND
1801 - 1951

SUBSIDIARY COMPANIES, BRANCHES AND AGENCIES THROUGHOUT THE WORLD
ASSOCIATED COMPANY IN CANADA:
HOLMAN-VULCAN LTD., HAMILTON, ONTARIO

HB25

The "A·B·C" of Faster, Lower Cost Drilling

Only **BLUE BRUTE** *Drifters Offer You This Performance-Boosting Construction at Three Key Points!*



Simplified Motor — *Positive Air Valve* — *Trouble-Free Lug Chuck*

Simplest, most rugged of drifter-motor drives, the Blue Brute Pneu-Motor assembly comprises a minimum number of parts.

Motor, valve and lug chuck—when these three drifter-elements pull together smoothly, you're on your way to yardage records! And in Blue Brute Drifters you can count on these key features for non-stop dependability on the toughest jobs you'll ever meet up with. Here's why:

(A) **Pneu-Motor** . . . Not "adapted" from some other air equipment, but especially designed for Blue Brutes, the Worthington Pneu-Motor is a standout for ruggedness—and the simplest drifter motor made. Parts are larger and fewer, assuring top wear-resistance and freedom from work-halting breakdowns.

(B) **Valve Assembly** . . . A famous Worthington "exclusive" that has won the tribute of being copied. But for checking wear and reducing air consumption, no other valve—copy or not—has ever equalled the positive-acting, end-seating Blue Brute valve.

(C) **Lug Chuck** . . . In Blue Brute Drifters the one-piece chuck sleeve reduces friction, holds alignment better, allows the piston to hit cleaner and harder. Worth considering when you remember that the chuck area is a major trouble-spot in ordinary drifter design.

WORTHINGTON

WORTHINGTON PUMP AND MACHINERY CORPORATION

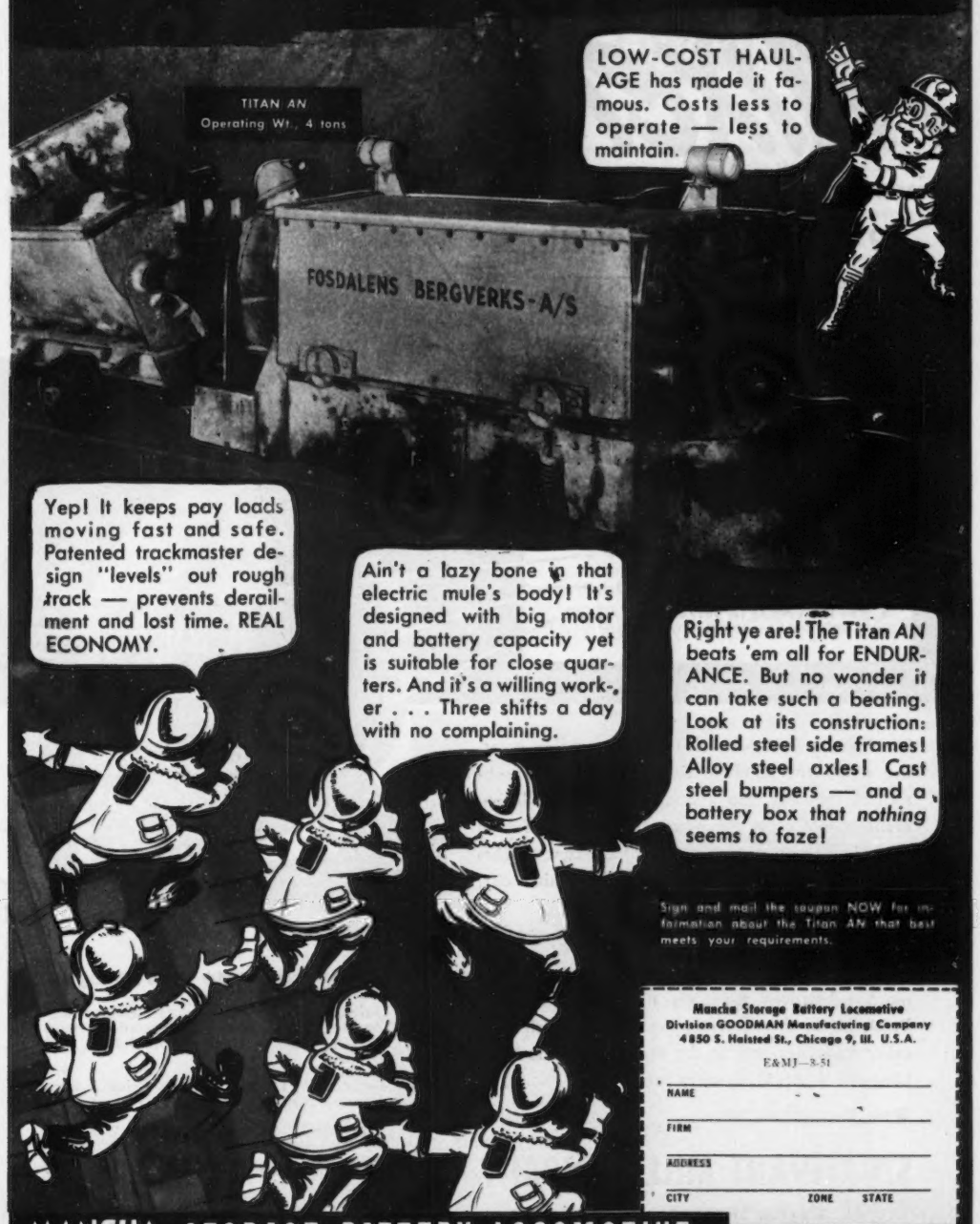
Mining Drill Sales Division • Dunellen, New Jersey

H0-8

Semi-Portable Compressors. Drifters with Feed Motor Incorporated. Drifters with Feed Motor on Shell. Hand-Crank Drifters. Stopers. Hand-Held Rock Drills.

Why not let your miners try Worthington Drifters—the WPM (Pneu-Motor on drifter), the WPMS (Pneu-Motor on shell) or the WHC (Hand Crank). Meanwhile, for further facts proving there's more worth in a Blue Brute, write for literature on the complete line.

EVERYONE RUNS TO WATCH A MANCHA TITAN AN RUN!


TITAN AN
Operating Wt., 4 tons
FOSDALENS BERGVERKS-A/S
LOW-COST HAULAGE has made it famous. Costs less to operate — less to maintain.
Yep! It keeps pay loads moving fast and safe. Patented trackmaster design "levels" out rough track — prevents derailment and lost time. REAL ECONOMY.
Ain't a lazy bone in that electric mule's body! It's designed with big motor and battery capacity yet is suitable for close quarters. And it's a willing worker . . . Three shifts a day with no complaining.
Right ye are! The Titan AN beats 'em all for ENDURANCE. But no wonder it can take such a beating. Look at its construction: Rolled steel side frames! Alloy steel axles! Cast steel bumpers — and a battery box that *nothing* seems to faze!

Sign and mail the coupon NOW for information about the Titan AN that best meets your requirements.

Mancha Storage Battery Locomotive
Division GOODMAN Manufacturing Company
4850 S. Halsted St., Chicago 9, Ill. U.S.A.

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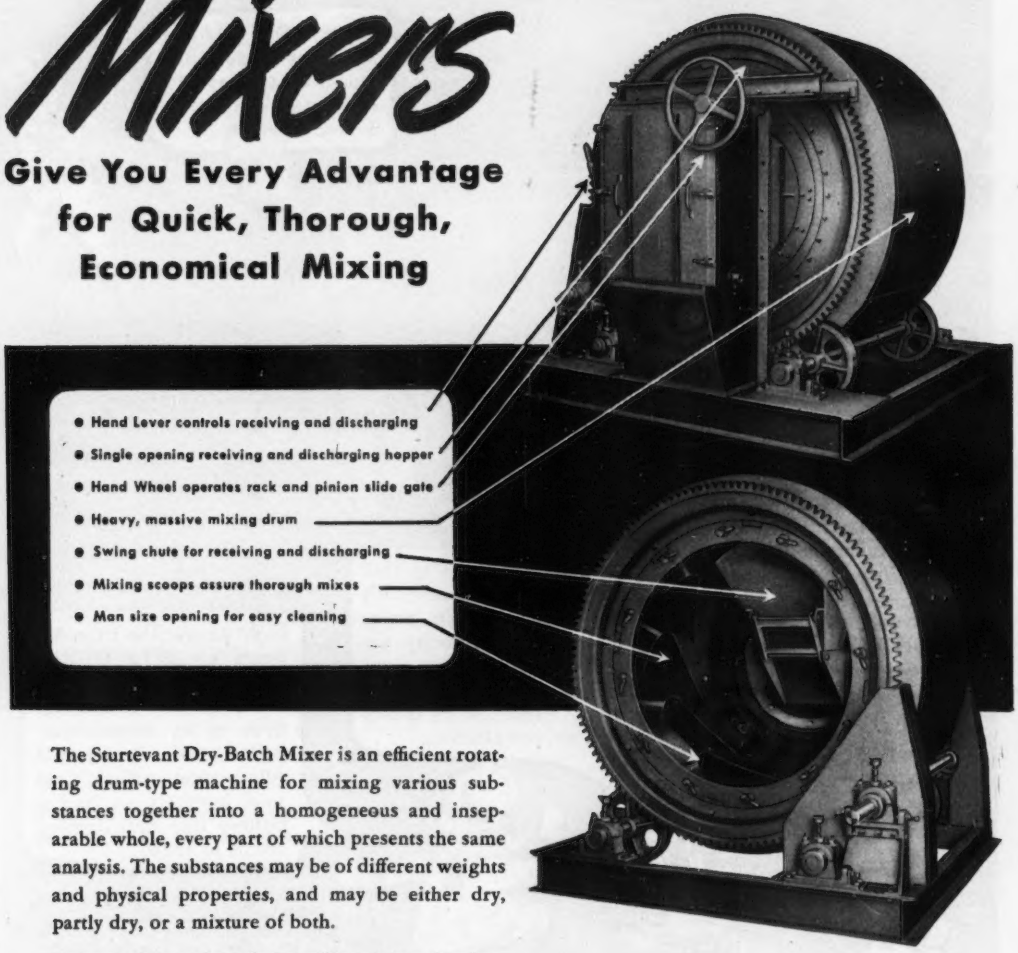
MANCHA STORAGE BATTERY LOCOMOTIVE

Division GOODMAN Manufacturing Company
4850 SOUTH HALSTED STREET CHICAGO 9, ILL., U. S. A.

Sturtevant Dry Batch

Mixers

Give You Every Advantage for Quick, Thorough, Economical Mixing


• Hand Lever controls receiving and discharging
• Single opening receiving and discharging hopper
• Hand Wheel operates rack and pinion slide gate
• Heavy, massive mixing drum
• Swing chute for receiving and discharging
• Mixing scoops assure thorough mixes
• Man size opening for easy cleaning

The Sturtevant Dry-Batch Mixer is an efficient rotating drum-type machine for mixing various substances together into a homogeneous and inseparable whole, every part of which presents the same analysis. The substances may be of different weights and physical properties, and may be either dry, partly dry, or a mixture of both.

Because of the unique design of its mixing chamber, and the 4-way mixing action which brings two or more substances together, the Sturtevant Dry-Batch Mixer does a more rapid mixing job than other machines and, at the same time, it is complete and thorough in every particular.

Write for bulletin today.

Compare These Advantages

- Only one lever controls both receiving and discharging for simplicity of operation. Hand wheel operates rack and pinion slide at feed opening.
- 4-way mixing action speeds production...assures thorough blends.
- "Open-door" accessibility permits easy, fast, thorough, cleaning.
- Single aperture drum for both intake and discharge.
- Unusually efficient scoops pick up materials to effect thorough mixing as drum revolves.
- 5 models . . . a size for every mixing job . . . smallest size mixes up to 7½ tons per hour . . . largest size up to 75 tons per hour.

STURTEVANT MILL COMPANY

101 Clayton Street, Boston 22, Mass.

Designers and Manufacturers of:

CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS
ELEVATORS • MIXERS
MECHANICAL DENS and EXCAVATORS

Here is *Exactly WHY* a V-Belt with CONCAVE SIDES Gives You *Longer Wear!*

What Happens When a V-Belt Bends

Straight-Sided V-Belt

Fig. 1

Fig. 2

Gates Vulco Rope with Concave Sides

Fig. 1-A

Fig. 2-A

How Straight-Sided V-Belt Bulges In Sheave-Groove. Sides Press Unevenly Against V-Pulley Causing Extra Wear At Point Shown by Arrows.

The Concave Sides Fill Out to a Precise Fit in the Sheave Groove. No Side Bulge! Sides Press Evenly Against the V-Pulley — Uniform Wear — Longer Life!

To see for yourself how a V-Belt that has concave *sides* is certain to give longer wear, just make this simple test:—

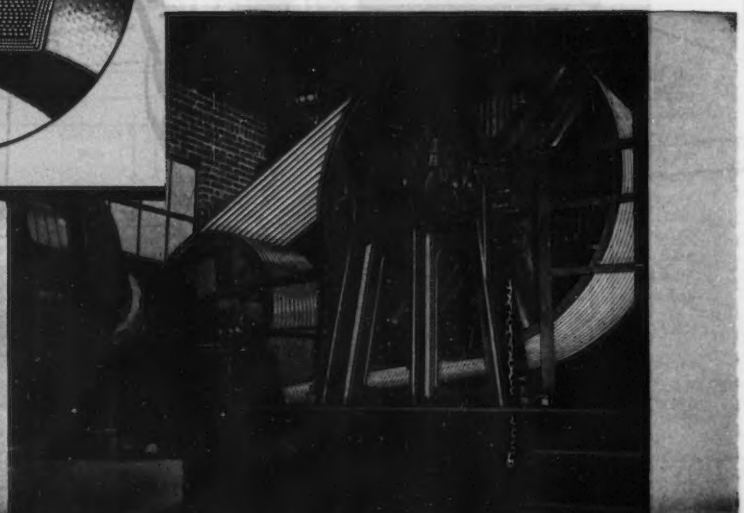
Pick up any V-Belt you have at hand. Bend that belt as it bends around a pulley. As it bends, grip its sides between your fingers. Here is what will happen *everytime*.

If the V-Belt you are testing has *straight sides*, you can feel those sides *bulge out* as the belt bends. This out-bulge forces the sides of the belt to press *unevenly* against the V-Pulley and you naturally get *concentrated* wear just where the bulge is greatest—as shown in figure 1-A, at left.

Now, make this same test with the belt that is built with Concave *Sides*—the Gates Vulco Rope!

Whereas you felt an *out-bulge* when you bent a belt with straight sides, you find that the *Concave Sides* merely fill out and become *perfectly straight*. The sides therefore *press evenly* against the V-Pulley. This distributes the wear *uniformly* across the *full width* of the belt. Naturally, this means longer belt life and *lower* belt *costs* for you!

Only V-Belts made by Gates are built with concave sides. Whenever you buy V-Belts, be sure that you get the V-Belt with the Concave Sides—The Gates Vulco Rope!



Gates Vulco Rope Drive on the Mine fan of Sloss Sheffield Steel & Iron Company, Birmingham, Alabama. The drive operated 24 hours a day for 3 years without down-time.

CS-517

Gates

Hose V-Belts
Molded Rubber Goods
for Industry

VULCO ROPE **DRIVES**

ENGINEERING OFFICES AND JOBBER STOCKS
IN ALL INDUSTRIAL CENTERS

THE GATES RUBBER COMPANY
DENVER, U. S. A.
The World's Largest Makers of V-Belts

He's safe. In either open pit or underground mines, the Westinghouse Ground Fault Protector, mounted at lower left on the auxiliary transformer skid, prevents injury to men and damage to machinery.

Westinghouse

EQUIPMENT FOR THE MINING INDUSTRY

YOU CAN BE **SURE**.. IF IT'S

Westinghouse

DOES YOUR MINE HAVE ADEQUATE GROUND FAULT PROTECTION?

IT PREVENTS INJURY, SPOTLIGHTS TROUBLE

Unprotected ground faults are dangerous. They can gravely injure men who touch equipment served by a faulted feeder. They result from electrical troubles that can damage machinery and cause shutdowns. Ask yourself two questions: Are the high-voltage circuits that supply your shovels or draglines adequately protected? Are you overlooking the danger in *auxiliary* circuits that serve drills, pumps, etc.? If you're in doubt, your Westinghouse representative can be a big help.

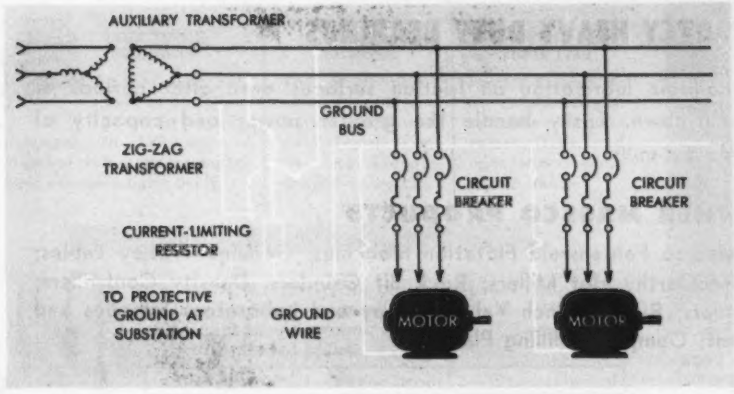
NOW—AUXILIARY CIRCUIT PROTECTION

Westinghouse has supplied high-voltage protective equipment for many years. Now, in answer to industry requests, Westinghouse offers a Ground Fault Protector for *auxiliary* circuits. This Protector is low in cost and easy to install. You bolt it to the auxiliary transformer skid and make simple electrical connections. When a fault occurs, the equipment served is immediately isolated. The trouble is then located, corrected and operation resumed. Men and machinery are safe.

HAVE WESTINGHOUSE CHECK YOUR SYSTEM

Call your Westinghouse office and have an engineer *make sure* your high-voltage protective system is adequate. Then have him tell you more about Westinghouse protection for auxiliary circuits. It's good business insurance. J-94850

HERE'S HOW THE AUXILIARY PROTECTOR PREVENTS INJURY



The frame of each of the motors, driving pumps, drills, etc., is connected to the ground wire (white line). If the current in the ground wire exceeds a predetermined safe amount, the circuit breakers serving the affected motors will trip. The faulted section is thus safely isolated and exposed as a trouble spot.

GET MORE INFORMATION NOW ON GROUND FAULT PROTECTION

Westinghouse Electric Corp.
P. O. Box 868
Pittsburgh 30, Pa.

Gentlemen:

Please send me without obligation the following information:

- ☐ Folder B-4747, Ground Fault Protection for Auxiliary Power Circuits in Open Pit Mines and Quarries.
- ☐ Booklet B-3282A, Electric Power Distribution and Protection for Open Pit Mines.

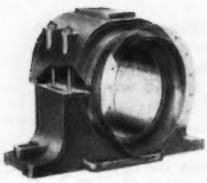
Name_____ Title_____

Address_____

ACTUAL INSTALLATIONS PROVE MARCY MILL DESIGN GIVES . . .

- **Greater grinding capacity**
- **More uniform grinding**
- **Less overgrinding**
- **Lower power consumption per ton of feed**
- **Lower maintenance costs per ton of feed**

Results are available to mill operators on comparison tests of grinding mills of equal size. In every instance the Marcy shows perceptible advantages in capacity and per ton costs. Competent, trained M & S engineers can give you the benefit of our long experience and complete milling data.



MARCY HEAVY DUTY BEARINGS

maintain lubrication on friction surfaces even after periods of shut-down. Easily handle the greater power and capacity of Marcy mills.

OTHER MASSCO PRODUCTS

Massco Fahrenwald Flotation Machines; Genuine Wilfley Tables; Massco-McCarthy Hot Millers; Rock Bit Grinders; Density Controllers; Belt Feeders; Rubber Pinch Valves; Assay and Laboratory Supplies and Equipment; Complete Milling Plants.

Main Office: DENVER, COLORADO, U.S.A.; El Paso; Salt Lake City; 1775 Broadway, New York, N. Y.; Canadian Vickers, Ltd., Montreal; W. R. Judson, Santiago and Lima; The Edward J. Nell Co., Manila, P. I.; The Ore & Chemical Corp., 80 Broad St., New York 4, N. Y., Representatives for Continental Europe.

The Mine & Smelter Supply Co.

for BETTER, SAFER LIGHTING use . . .

JOY String-a-lite®

DURABLE • TROUBLEFREE • FOOLPROOF

Joy String-a-lite lines are of one-piece molded Neoprene construction—watertight, shatterproof, and age-resistant.

Oils, acids, alkalies or moisture have little effect on their life span or conducting efficiency.

Combinations can be easily installed, moved or varied, by untrained personnel, to fit the requirements of any mine lighting job.

FURNISHED IN VARIOUS LENGTHS WITH OUTLETS AT REGULAR INTERVALS, AS SPECIFIED

THREE LIGHT STYLES

EHS LAMP OUTLET

Snug fitting Neoprene lip at bulb neck seals out water, dirt and oil.

FSC SIDE OUTLET

Accommodates ERS "Plug-in" Socket or Hand Extension Lamps.

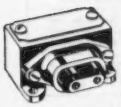
ERS PLUG-IN SOCKET

Converts FSC Side Outlet to Weather-Sealed light socket.

VEIS VAPOR-PROOF LIGHT

Has glass globe with sturdy metal guard, for protecting light bulb. 100 watt size.

SAFE POWER CONNECTIONS



241FR FEMALE RECEPTACLE

A power outlet, consisting of Neoprene insert in sturdy metal housing. No. LFR—same as above except with insert for engaging hand extension lights below.

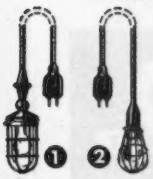
AHBED EXTENSION

100′ of Neoprene covered cord with 241M Male and 241F Female Connectors, factory molded on ends.

241F POWER LEAD

Female Connector on cable length specified by customer. Other end open for wiring into power source.

HAND EXTENSION LIGHTS

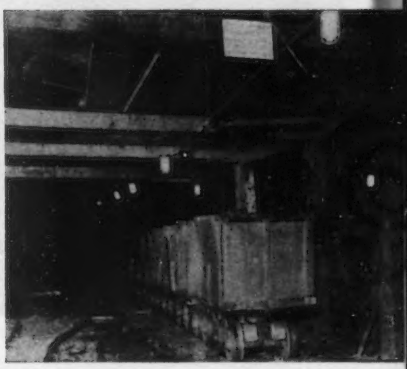


Choice of Weather-proof or Vapor-proof lamp styles molded to Neoprene covered cord with LMC Male end Connector. Accommodates up to 100-watt standard Edison based bulbs.

Cord Length	1—Vapor-proof	2—Weather-proof
25′	V5A	W5A
50′	V6A	W6A

JOY String-a-Lite installations at Chief Consolidated Mining Company, Eureka, Utah.

ABOVE—Photo illustrates convenience and safety of JOY Vapor-proof Lights in exceptionally wet working areas.



ABOVE—JOY VEIS Vaporproof String-a-lite illuminating an important haulage-way.

Write for your free copy of Bulletin SL-202 or *Consult a Joy Engineer*

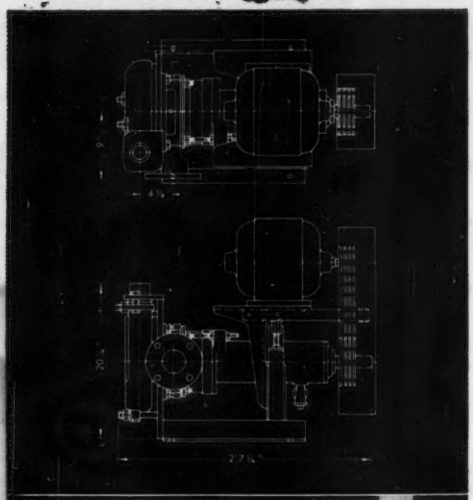
W&D ME2565

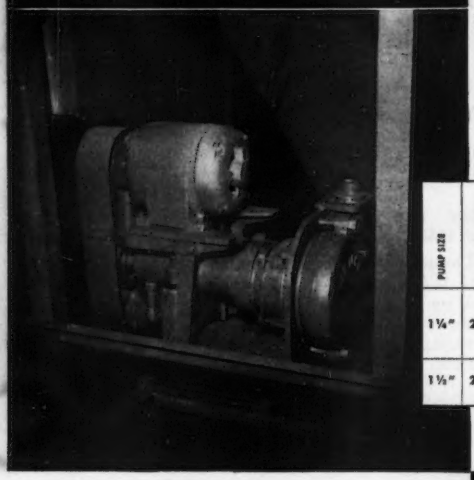
JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

NEW 1 1/4" & 1 1/2" WEMCO SAND PUMPS





for efficient pumping of small pulp volumes

Now available in these new small sizes, **WEMCO** Sand Pumps fit the exact requirements of small mills, pilot plants and split circuits in larger flowplans. For pulp flow rates up to 100 gpm, these smaller pumps save in first cost, power consumption and upkeep. Like the larger **WEMCO** Sand Pumps, the new 1 ¼" and 1 ½" units are complete with all the rugged features that mean reliable service.

FEATURES

- ***Hard alloys*** *in case, runner, follower plate and die ring minimize wear rate.*
- ***Centrifugal sealing*** *eliminates packing and sealing water and reduces running friction.*
- ***Left or right hand feed*** *may be set up by a simple 180° rotation of the intake.*
- ***Gravity intake*** *feeds directly to the impeller center to prevent intake sanding.*
- ***Welded steel base*** *is strong, non-breakable and light in weight.*

SPECIFICATIONS

PUMP SIZE	INTAKE DIAMETER	DISCHARGE DIAMETER	STD. RUNNER DIAM.	MAX. PARTICLE SIZE	REQ'D INTAKE HEAD	CAP. IN U.S. G.P.M.	HORSEPOWER AND RPM AT VARIOUS DISCHARGE HEADS *Horsepower at given capacity is for pumping clear water. For normal operations multiply this horsepower by the specific gravity of the pulp to obtain required horsepower for a given condition.*									
							20'		30'		40'		50'		60'	
							RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP
1¼"	2½"	1¼"	9"	¼"	2'-4'	20	1055	.7	1280	1.4	1475	1.9	1650	2.6		
						40	1080	.8	1300	1.7	1495	2.0	1665	2.7		
						60	1115	1.0	1330	2.0	1520	2.2	1690	2.8		
1½"	2½"	1½"	9"	¼"	2'-4'	80	1090	1.4	1300	2.1	1500	3.3	1675	4.8	1825	6.2
						100	1120	1.6	1320	2.3	1520	3.4	1690	5.0	1840	6.4

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MOBIL-MILLS
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DENSIFIERS
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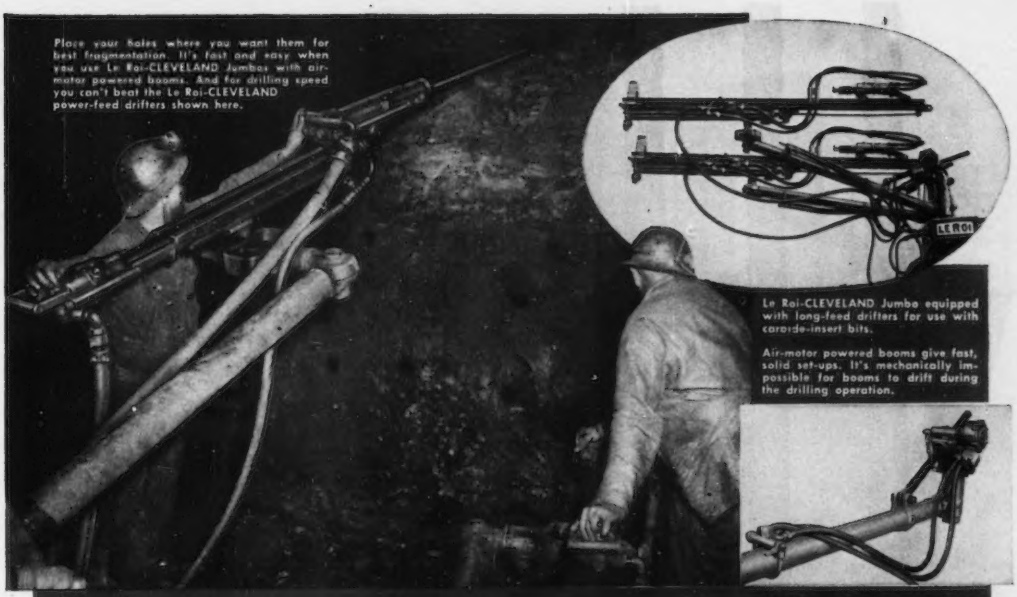
FAGERGREN LABORATORY UNITS
HYDROSEPARATORS
HMS LABORATORY UNITS
DEWATERING SPIRALS
AGITATORS
S-H CLASSIFIERS
THICKENERS
SAND PUMPS
CONDITIONERS


Place your holes where you want them for best fragmentation. It's fast and easy when you use Le Roi-CLEVELAND Jumbos with air-motor powered booms. And for drilling speed you can't beat the Le Roi-CLEVELAND power-feed drifters shown here.
LE ROI
Le Roi-CLEVELAND Jumbo equipped with long-feed drifters for use with carbide-insert bits.
Air-motor powered booms give fast, solid set-ups. It's mechanically impossible for booms to drift during the drilling operation.

Drilling-Cycle Time Reduced, Footage per Shift Increased

. . . when you use Le Roi-CLEVELAND Jumbos and power-feed drifters in your rock headings

THERE are three things you have to do if you want to save time in your drilling cycle and increase your footage — reduce set-up time, drill out the round faster, and shorten tear-down time.

You know this and so do we. That's why we designed the Le Roi-CLEVELAND jumbo the way it is. And that's also why our drifters drill so fast.

Let's see what you get when you use Le Roi-CLEVELAND:

★ The most flexible jumbo available. Air-motor powered booms let you space your holes quickly and easily for most efficient fragmentation.

★ Rigid, non-slip set-up feature keeps drifters in line, prevents steel binding, saves wear and tear on chucks, results in higher average drilling speeds.

★ Strong rotation, plus snappy yet powerful force of blow of Le Roi-CLEVELAND drifters gives you unexcelled drilling speed. This drilling speed coupled with the fast, positive feeding action of our power feed gives you the right pressure for fastest drilling and reduces drill-steel changing time.

You add all these advantages together when you use Le Roi-CLEVELAND jumbos and power-feed drifters. The outcome is faster drilling cycles, more footage per shift—so why not standardize on these cost-cutting honeys. Write for complete information.

LE ROI COMPANY RD-42

CLEVELAND ROCK DRILL DIVISION
12500 Berea Road, Cleveland 11, Ohio
Plants: Milwaukee, Cleveland and Greenwich, Ohio

Why Make a Mystery of Wire Rope Costs?

Every once in a while we run across somebody who's hopelessly confused about his wire rope costs. Sure, his books show him the total he spends each year—so much for this brand, so much for that brand, so much for a third. But he never really knows what he's getting from each brand in terms of work.

And work is what he buys with every cent he spends on rope. Work determines the cost—the *actual* cost.

He could easily clear things up by recording what each rope does . . . in terms of ton-miles, cubic yards of rock moved, or other simple, appropriate units. That would give him a basis for actual comparisons of costs and actual comparisons of brands.

Bethlehem has long recommended such a system, and more and more customers are using it. They have found it well worth the minor effort involved, for it's done away with guessing. They've found, too, in keeping such records, that every dollar spent on Bethlehem rope buys a mighty big dollar's worth of service.

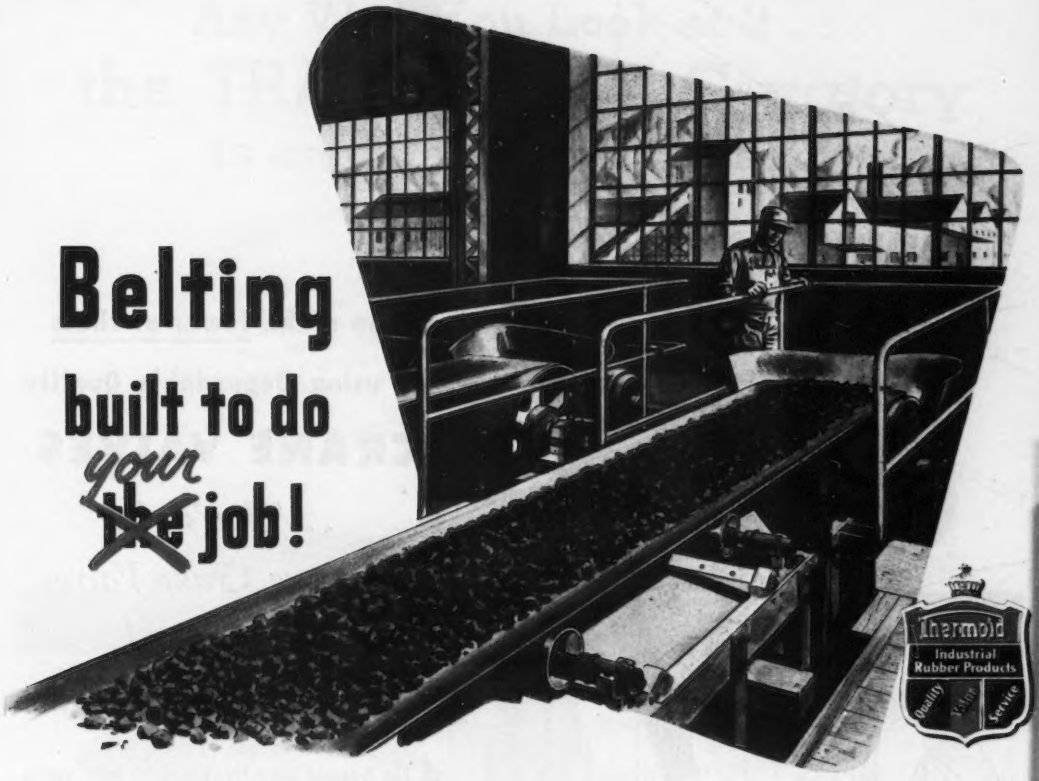
LET YOUR RECORDS TELL YOU!

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

Belting built to do ~~the~~ *your* job!



THERMOID custom-built conveyor belts promote profitable operation

Toughness measured by long years of industry-wide approval is your basic assurance of satisfaction with ***Thermoid*** Conveyor Belting. Its record of endurance is documented by results that mean greater profits. And equally important — ***Thermoid*** advanced engineering adapts this rugged product to your specified belting requirements, assuring an installation that will do the job . . . YOUR job! Whether your need is conveyor belting for mining operations, ore concentrating, smelting, refining or dredging — call your ***Thermoid*** distributor. If you have a special problem a ***Thermoid*** Field Representative is always available to help you select the right belt for YOUR job.

Conveyor & Elevator Belting • Transmission Belting
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today piping repairs cost more!

Crane No. 465½
Iron Body Gate Valve

You make fewer of them by using Dependable Quality

CRANE VALVES

...That's why more Crane Valves are used than any other make

No bonnet joint trouble with this valve

A typical example of low-cost maintenance—Crane No. 465½ 125-Pound Iron Body Gates. Rarely does the bonnet joint need attention. Flange construction includes reinforcement to prevent distortion and utilizes more bolts, more closely spaced, than is usual in valves of this class. Crane precision-guided seating reduces seat and disc wear. Packing has long life because these valves have a deep stuffing box filled with high grade asbestos ring packing. A ball-type gland helps to equalize the packing load.

Better performance features like these make Crane the better buy in valves of every type. They assure low maintenance cost—low ultimate valve cost—for every piping service.

CRANE CO.

General Offices:
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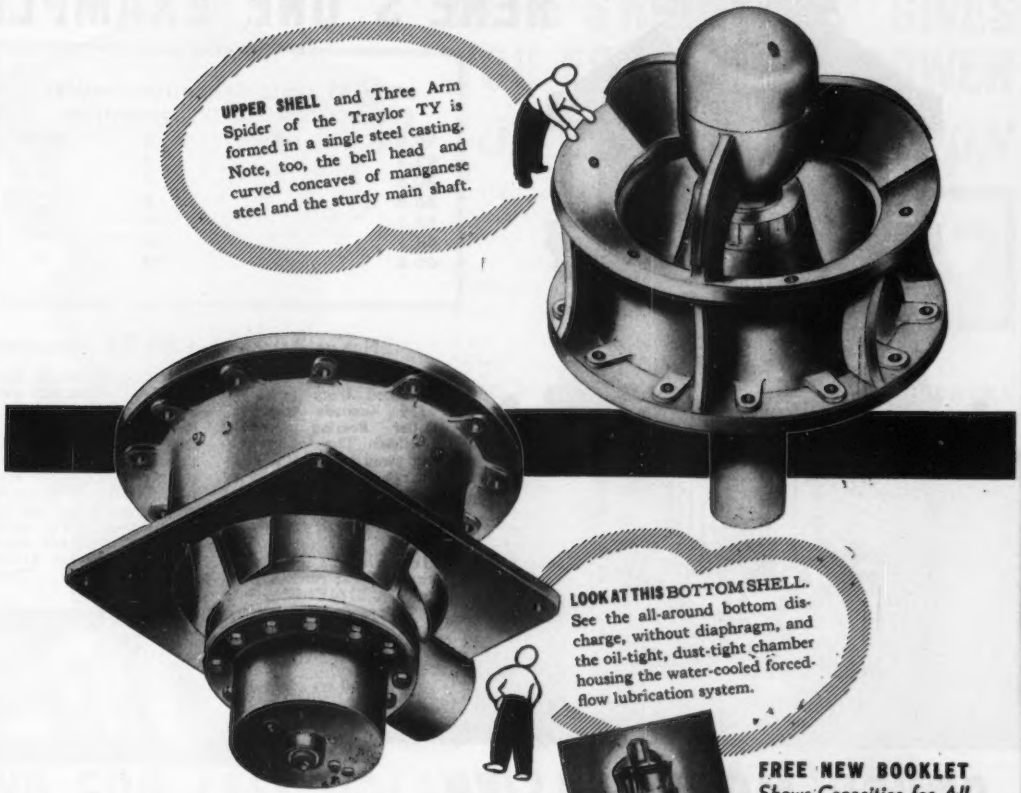
Any Way You Look at it . . .
the TRAYLOR TY Gyratory
is an outstanding Crusher

UPPER SHELL and Three Arm Spider of the Traylor TY is formed in a single steel casting. Note, too, the bell head and curved concaves of manganese steel and the sturdy main shaft.



LOOK AT THIS BOTTOM SHELL. See the all-around bottom discharge, without diaphragm, and the oil-tight, dust-tight chamber housing the water-cooled forced-flow lubrication system.

The design features described above, enable the Traylor TY to maintain its lead in the field of secondary fine crushers. With the increased capacity of each succeeding zone in the crushing chamber the TY has a remarkably low power-per-ton factor. These features as well as many others are fully described in the Traylor TY Reduction Crusher bulletin. Return the coupon for your free copy today.

FREE NEW BOOKLET
Shows Capacities for All 6 Sizes. Mail Your Coupon Today.

TRAYLOR ENGINEERING & MANUFACTURING CO.
374 MILL ST., ALLENTOWN, PA.

I want to see how a Traylor TY will cut my reduction costs.

*Name*_____

*Company*_____

*Address*_____

SALES OFFICES: New York, N.Y.; Chicago, Ill., Los Angeles, Calif.
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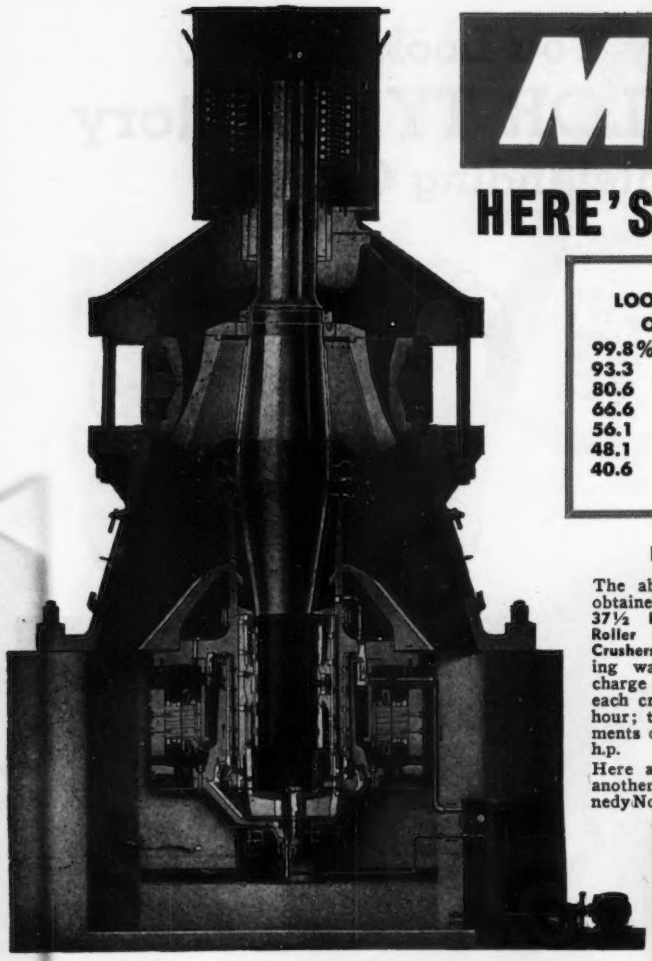
Traylor

Rotary Kilns, Coolers and Dryers • Grinding Mills
Jaw, Reduction and Gyratory Crushers • Crushing Rolls

A "TRAYLOR" LEADS TO GREATER PROFITS



MORE

HERE'S ONE EXAMPLE!

LOOK AT THESE GRADATION FIGURES ON CLOSED CIRCUIT OPERATION

99.8%	Minus	3	MESH
93.3	"	4	"
80.6	"	6	"
66.6	"	8	"
56.1	"	10	"
48.1	"	14	"
40.6	"	20	"

Not only more—but BETTER production!

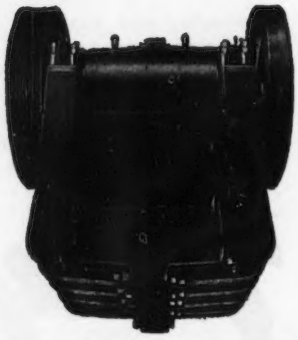
The above results were obtained from four **No. 37½ Kennedy type "S" Roller Bearing Gyratory Crushers.** The feed opening was 6¼", the discharge 7/32". Capacity of each crusher 56 tons per hour; the power requirements of each crusher 48 h.p.

Here are the results of another test run! A Kennedy No. 37½ Crusher with a Special Grinding Ring 3" Feed Opening gave 50% more product (and a finer, better product at that) for about HALF the power cost of a competitive crusher of comparable size. With power costing say 1 cent per h.p. hour, this KVS saved some 40 h.p. (or about $11.00 daily) or around $3,000 a year. Think THAT over!

MORE

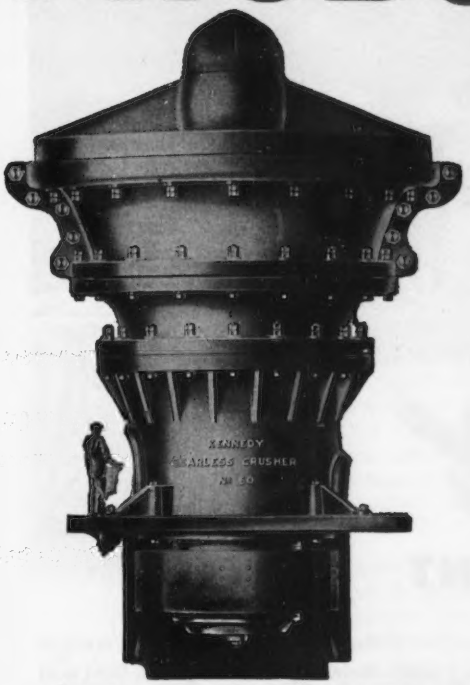
CRUSH MORE--*EASIER*

There's less wasted power and effort in the "KVS" SWING JAW CRUSHER since we redesigned the STATIONARY jaw to carry 50% of the crushing load. Result—you get more production and get it more efficiently. We looked into MAINTENANCE too. The swing jaw is now ALL IN ONE PIECE, except for the crushing plate. That's removable. Note also—Swing and Stationary jaws are INTERCHANGEABLE, and reversible end for end. That DOUBLES jaw-crushing life while your production keeps right on mounting.

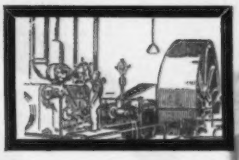


MORE PRODUCTION! **MEANS "KVS" EVERY**

PRODUCTION!



HERE'S HOW "KVS" GIVES YOU FREE ADDED POWER *FOR MORE PRODUCTION*



In the "good old days," the big whirling flywheel or pulley of an old Corliss Engine developed added extra KINETIC ENERGY! That meant added FREE power! TODAY the BIG Revolving Pulley in the "KVS" Gearless does the same thing. It revolves at 3,500 ft. per minute—creates EXTRA crushing power for more production—in fact you get it like a bonus! The 11 ton pulley (used in a "KVS" Gearless Crusher weighing 400,000 lbs.) turns so easily you can turn it on its roller bearings with TWO FINGERS! Look here, man—more CRUSHING with LESS POWER, less vibration and less NOISE, too, has put the "KVS" Gearless way out in front when it comes to added production—and keeps it there!

PRODUCTION!

AND FOR *LESS* DOLLARS

Is your production dependent on a 10′ diameter ball mill? If so, you can save up to $5,000 by buying a "KVS" Mill with integral gear drive and using a SYNCHRONOUS MOTOR DIRECT CONNECTED to driving shaft carried in roller bearings that CANNOT be misaligned or set wrong. Pinion shaft runs at about 600 r.p.m. Pinion shafts in other mills run at about 180 r.p.m. "KVS" trunnions on large sized tube and ball mills CARRIED ON OIL. Bearing never wears out, uses little power. All gears and bearings automatically oil sprayed before mill is started (design pat'd). In 15 years on this type mill no "KVS" gears or pinions have worn out. Send for all "KVS" Bulletins for complete data.

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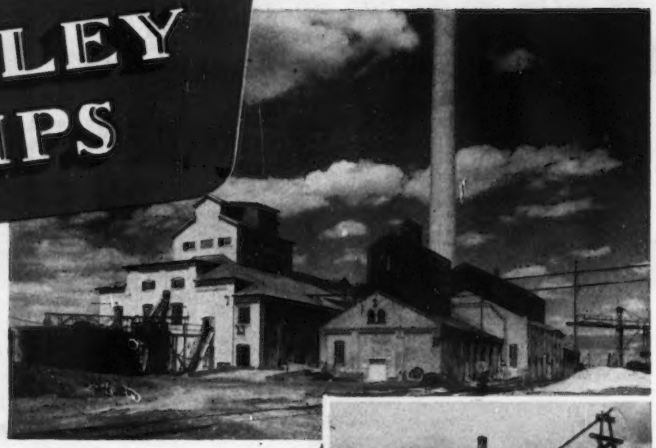
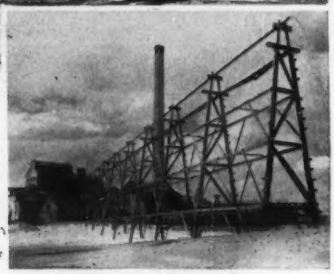
TIME—YES SIR!

WILFLEY PUMPS

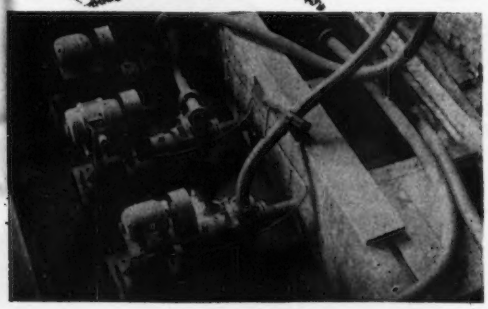
Used At...



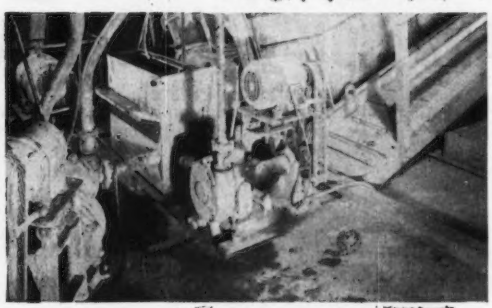


Climax URANIUM PLANT

The great CLIMAX URANIUM COMPANY PLANT at Grand Junction, Colorado, built primarily for uranium processing, uses WILFLEY pumps throughout. WILFLEY Model K sand, Model AF acid, and plastic lined acid pumps maintain continuous, trouble-free, high-efficiency performance with leaching solutions, tailings, vanadium and uranium leach liquors, dilute acids, sand slime, roaster calcine and other chemical solutions. Individual engineering on every application. Buy WILFLEY for lower production costs. Write or wire for details.



Plastic Lined Pumps in Tank House. *These acid-proof pumps receive vanadium and uranium leach liquors from leaching tanks and pump them to various treatment tanks located in the main portion of the building.*

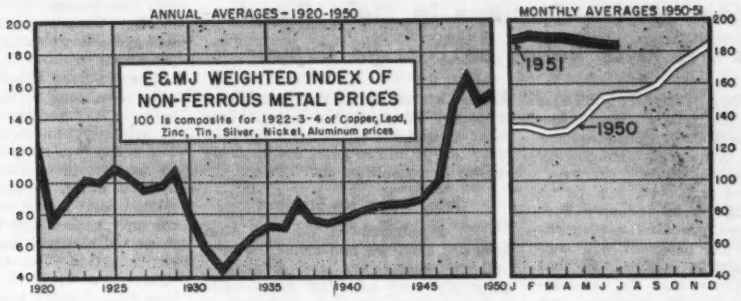


Grind Circuit Circulation Model K Pumps. *These sand pumps receive the classifier overflow and pump the material to the sand slime separation circuit located at a higher elevation.*

A. R. WILFLEY & SONS, Inc., Denver, Colorado, U.S.A., New York Office: 1775 Broadway, New York City

E&MJ OUTLOOK

PRICES



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MARKETS

The price structure's strong in non-ferrous metals, despite the slip of 0.73 points in the E. & M. J. index for July, to 186.46. As in past months, the skid reflects RFC's private war on the tin price.

Peace prospects in Korea prompt some speculation on how long metal consumption can hold present high rates. The prospect is that military programs, only now beginning to chew up metal, plus continued expansion of hard-goods industries, will build up a demand at least equal to the next 12 months' output of metals.

•

LABOR

There's trouble ahead. The CIO got what it wanted when the Garfield dispute went to Washington for "mediation," where the employer will probably lose some hide and hair. But Mine, Mill's bitter rivalry with CIO will power a drive to outdo whatever CIO gets, has already stung Mine, Mill into a general metal mine strike vote. Employers, and the public, will take a beating from both sides in this inter-union battle.

•

AT HOME

If the Kaesong talks result in a real cease-fire in Korea, and if the Russians don't fire up another scrap this year, one can expect business to hold present levels. The facts don't support the notion that peace (modern version) would cause serious deflation.

Under the new controls law, Truman can subsidize some high-cost metal mines if he wants to. This may help a drive, now shaping up, to get premium prices for metals. Chief hindrance will come, not from blue-chip producers, but from cost-conscious Congressmen.

Washington's new, and long overdue, Defense Materials Procurement Agency, plus some executive changes, had "unified" Government minerals agencies dazed at July's end. Although it looks promising, the new DMPA will flounder too, unless mining's top men pitch in and help.

General Services Administration is reported to have unsprung those big metal mining assistance contracts, blocked for months somewhere in the DPA. Catch is that the Government proposes new terms that some producers may not find acceptable. But at least the wheels are moving.

GSA also has opened depots to buy manganese ore at Butte, Philipsburg, and Deming. Lower limits are 12% Mn for Butte, and 15% Mn at the other two. Get word to them by Sept. 15, if you're interested.

•

ABROAD

Free market gold, in the Far East, is looking up again. This doesn't mean war, however, just a short supply. The weakening British pound is causing a flight of capital, first since the war.

MARKETS—Trends and Prices

Non-Ferrous Metals Continue in Tight Supply—Smelters Get Price Relief on Foreign Copper

MAJOR NON-FERROUS METALS were in tight supply and strong price-wise throughout July. Continued unsettlement in the sensitive commodity markets, resulting from "progress" in negotiations in Korea, exerted no influence on the metal industry. Producers received repeated assurances that the defense program will continue to expand in volume and that the requirements call for ever-increasing supplies of strategic raw materials. However, operators did take note of a more conservative approach to pricing metals in European centers and the wide spread of recent months between so-called official quotations and top war-scare levels has narrowed considerably. Countries in the Atlantic Pact are moving toward control of imports and exports.

World-wide allocation of tungsten, molybdenum and sulphur for the third-quarter was announced during July by the International Materials Conference. Eleven countries producing and consuming these important commodities endorsed an interim plan. A long-term program is expected soon. With the exception of Brazil, member countries agreed that producers of tungsten ore and concentrates will not demand a higher price than $65 per short ton unit of WO_3, f.o.b. point of shipment.

The Federal Reserve Board's index of production for July is expected to decline moderately to 215% of the 1935-39 average, owing to the vacation period at manufacturing plants and limitation orders on materials. The index for June was 222% of the base period.

Continued pressure on the price of tin by the RFC resulted in an average for the month in that metal of $1.06 per pound. This more than offset a higher average for foreign silver and caused our index of non-ferrous metal prices to fall to 186.46 for July, which compares with 187.19 in the preceding month.

Metals Under Allocation

NPA added zinc and lead to metals under allocation, the first-named effective with August shipments to consumers and the other taking hold in September. The controlled materials plan began to operate on a broader scale in copper, aluminum, and steel. In reference to steel, Eugene G. Grace, chairman of Bethlehem Steel, declared that if customers get all the steel they are asking for under CMP, they will be vastly overstocked by the end of the year. There is plenty of steel for a peacetime economy and the defense job, he said, and there is no use getting everybody stirred up by talk of shortages.

Price Relief for Smelters

OPS announced on July 25 that domestic smelters and refineries purchasing imported copper-bearing raw materials may sell the recoverable copper content of such material on the basis of 27½¢ per pound. The regulation, retroactive to May 21, also applies to sellers of refined copper processed from imported materials on a toll conversion basis. Price relief was granted to maintain the flow of foreign raw material into this market. Most of the purchase contracts on foreign ores and concentrates specify the E&MJ average on foreign copper.

The pricing agency made it clear that the ceiling price of copper in this country remains at 24½¢, Connecticut Valley, and no action to change that figure is contemplated "at this time."

In industry circles it was felt that the two-price system should be abolished. Fabricators are up against a tough pricing problem on their long list of products.

Production of copper in this country in July met with a setback because of a four-weeks' strike at the Garfield smelter of AS&R Co. The dispute went to the Wage Stabilization Board for recommendations. Workers finally returned to their jobs on a plea from President Truman. The smelter treats concentrates from ore obtained from Utah's open pit mine. The threat of work stoppages at other properties threatened as the month ended.

Copper producers shipped 114,103 tons of copper to domestic consumers during June, making the total for the Jan.-June period 671,366 tons. The copper content of products shipped by fabricators to their customers during June was 129,283 tons, making the total for the first half of the year 725,463 tons. Fabricators reduced their stocks of refined copper from 290,241 tons at the beginning of the year to 237,808 tons at the end of June. The strategic stockpile absorbed around 56,900 tons of refined copper in the first half of the year.

Negotiations between Chilean officials and producers in that country have progressed to the point where an agreement on the copper program has virtually been reached. It covers such matters as taxation, exchange rates, and marketing of the 20% quota locally. Copper producers, in turn, will spend large sums on an expansion program.

The National Production Authority ordered allocation of the supply of soft pig lead produced in this country by primary refiners, effective July 26. The action was necessary, it was said, to assure the equitable distribution of the available supply. Beginning September 1, soft primary pig lead for any purpose may be accepted only in accordance with an NPA allocation authorization. The regulations, contained in order M-76, do not apply to lead from foreign sources.

Demand for lead here absorbed all offerings. Consumers purchased foreign lead on an f.o.b. port of shipment basis on a more extensive scale and it begins to look as though imports in the second half of the year will turn upward. Most of this foreign metal was purchased at prices ranging from 20½¢ to 22¼¢ per pound, with transportation costs and duty (if any) extra. Legislation has been introduced in Washington to lift the duty on a

Average Prices for July (E&MJ Quotations)

Copper:	
Electrolytic, domestic, refinery	24.200
Electrolytic, Export, Refinery	27.425
Lead:	
Common, New York	17.000
Common, St. Louis	16.800
Silver and Sterling Exchange:	
Silver, New York, per oz.	90.160
Silver, London, pence per oz.	78.500
Sterling Exchange, "Checks"	279.982
Zinc:	
Prime Western, East St. Louis	17.500
Tin:	
New York Straits	106.000
New York, 99% min. (e)	105.000
Gold, per oz. U.S. price	$35.000
Quicksilver, per flask	$206.800
Antimony (E&MJ) (d)	45.300
Antimony, bulk, Laredo	42.000
Antimony, in cases, Laredo	42.500
Platinum, refined, per oz.	$90.000
Cadmium (a)	255.000
Cadmium (b)	267.500
Cadmium (c)	280.000
Aluminum, 99% plus, ingot	19.000
Magnesium, ingot	24.500
Nickel (f)	56.500

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lb.
(a) Cadmium average based on the producers' quotation.
(b) Cadmium average based on the average of the producers' and platers' quotation.
(c) Cadmium average based on platers' quotation.
(d) Domestic, 5 tons or more but less than carload lot, packed in cases, f.o.b. New York.
(e) Tin content.
(f) F.o.b. Port Colborne, U.S. duty included.

temporary basis, with adequate price safeguards.

The ceiling on lead continues at 17¢, New York. In the export market, business was noted during the month at 21½¢ to 22¼¢ per pound, f.a.s. Gulf ports.

Zinc allocation preceded that of lead. Commencing with August 1, the acceptance of slab zinc must conform with the regulations issued by NPA. The order applies to all persons who produce, consume, trade in, or hold zinc in inventory. Zinc imported for resale as slab zinc also was brought under control in the revised order M-9.

Slab zinc production in the United States totaled 77,679 tons in June; shipments amounted to 79,299 tons; stocks in producers' hands declined to 15,791 tons. In the first five months of 1951, mines in this country produced an average of 58,254 tons of recoverable zinc a month. The monthly average for all of 1950 was 51,517 tons.

The struggle over what constitutes a fair price for tin continued in Government circles. The head of RFC declared "We want a price that is fair to the consumer and the supplier and stabilize it there." Throughout July, RFC maintained its quotation at $1.06 per pound, New York. An agreement has been reached in principle with the Bolivian authorities on a tin price of $1.12, it was disclosed. Because Bolivia is a "high cost" area, other producers were told they could not expect a similar deal.

Ceiling prices higher than the going market level are expected for antimony and platinum.

Quicksilver was unsettled, with offerings here at prices below the prevailing import basis. Business was dull.

Cadmium restrictions were eased by NPA because of an accumulation in supplies in the hands of producers.

(Continued on page 87)

Major Metals

U. S. DAILY AND AVERAGE PRICES

July 1951	Electrolytic Copper (a) Domestic	Electrolytic Copper (b) Export	Straits Tin New York	Lead New York	Lead St. Louis	Zinc East St. Louis	July 1951	Sterling Exchange "Checks"
2	24.200	27.425	106.000	17.000	16.800	17.500	2	280.000
3	24.200	27.425	106.000	17.000	16.800	17.500	3	280.000
4	Holiday	27.425	Holiday	Holiday	Holiday	Holiday	4	Holiday
5	24.200	27.425	106.000	17.000	16.800	17.500	5	280.000
6	24.200	27.425	106.000	17.000	16.800	17.500	6	280.000
7	No Market	27.425	106.000	17.000	16.800	17.500	7	(e)
9	24.200	27.425	106.000	17.000	16.800	17.500	9	280.000
10	24.200	27.425	106.000	17.000	16.800	17.500	10	280.000
11	24.200	27.425	106.000	17.000	16.800	17.500	11	280.000
12	24.200	27.425	106.000	17.000	16.800	17.500	12	280.000
13	24.200	27.425	106.000	17.000	16.800	17.500	13	280.000
14	No Market	27.425	106.000	17.000	16.800	17.500	14	(e)
16	24.200	27.425	106.000	17.000	16.800	17.500	16	280.000
17	24.200	27.425	106.000	17.000	16.800	17.500	17	280.000
18	24.200	27.425	106.000	17.000	16.800	17.500	18	280.000
19	24.200	27.425	106.000	17.000	16.800	17.500	19	280.000
20	24.200	27.425	106.000	17.000	16.800	17.500	20	280.000
21	No Market	27.425	106.000	17.000	16.800	17.500	21	(e)
23	24.200	27.425	106.000	17.000	16.800	17.500	23	280.000
24	24.200	27.425	106.000	17.000	16.800	17.500	24	280.000
25	24.200	27.425	106.000	17.000	16.800	17.500	25	280.000
26	24.200	27.425	106.000	17.000	16.800	17.500	26	280.000
27	24.200	27.425	106.000	17.000	16.800	17.500	27	279.875
28	No Market	27.425	106.000	17.000	16.800	17.500	28	(e)
30	24.200	27.425	106.000	17.000	16.800	17.500	30	279.875
31	24.200	27.425	106.000	17.000	16.800	17.500	31	279.875
	AVERAGES FOR MONTH							**AVERAGES FOR MONTH**
July	24.200	27.425	106.000	17.000	16.800	17.500	July	279.982
	AVERAGES FOR WEEK							**AVERAGES FOR WEEK**
July							July	
4	24.200	27.425	106.000	17.000	16.800	17.500	4	280.000
11	24.200	27.425	106.000	17.000	16.800	17.500	11	280.000
18	24.200	27.425	106.000	17.000	16.800	17.500	18	280.000
25	24.200	27.425	106.000	17.000	16.800	17.500	25	280.000
	CALENDAR WEEK AVERAGES							
July								
7	24.200	27.425	106.000	17.000	16.800	17.500		
14	24.200	27.425	106.000	17.000	16.800	17.500		
21	24.200	27.425	106.000	17.000	16.800	17.500		
28	24.200	27.425	106.000	17.000	16.800	17.500		

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

July 1951	Silver (c) New York	Silver (c) London	Gold London	Gold (d) United States
2	90.160	78.500d.	248s.	$35.00
3	90.160	78.500d.	248s.	35.00
4	Holiday	78.500d.	248s.	Holiday
5	90.160	78.500d.	248s.	35.00
6	90.160	78.500d.	248s.	35.00
7	(e)	(e)	(e)	35.00
9	90.160	78.500d.	248s.	35.00
10	90.160	78.500d.	248s.	35.00
11	90.160	78.500d.	248s.	35.00
12	90.160	78.500d.	248s.	35.00
13	90.160	78.500d.	248s.	35.00
14	(e)	(e)	(e)	35.00
16	90.160	78.500d.	248s.	35.00
17	90.160	78.500d.	248s.	35.00
18	90.160	78.500d.	248s.	35.00
19	90.160	78.500d.	248s.	35.00
20	90.160	78.500d.	248s.	35.00
21	(e)	(e)	(e)	35.00
23	90.160	78.500d.	248s.	35.00
24	90.160	78.500d.	248s.	35.00
25	90.160	78.500d.	248s.	35.00
26	90.160	78.500d.	248s.	35.00
27	90.160	78.500d.	248s.	35.00
28	(e)	(e)	(e)	35.00
30	90.160	78.500d.	248s.	35.00
31	90.160	78.500d.	248s.	35.00
	AVERAGES FOR MONTH			
July	90.160	78.500d.	—	35.00
	AVERAGES FOR WEEK			
4	90.160	—	—	—
11	90.160	—	—	—
18	90.160	—	—	—
25	90.160	—	—	—

Calendar week averages, New York Silver: July 7th, 90.160; 14th, 90.160; 21st, 90.160; 28th, 90.160.

(e) No market (Saturday.)

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c. per pound, the average differential for delivery charges.

(b) Our export quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c. for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c. to 0.15c. per pound.

Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West, effective Jan. 1, 1951, commanded a premium of 1.15c. per pound over the current market for Prime Western; Special High Grade 1.50c.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 points.

(c) The daily New York silver quotation reported by Handy & Harman is for silver contained in ores and other unrefined silver-bearing materials, in cents and fractions of a cent per troy ounce. It is determined by Handy & Harman on the basis of actual sales of bar silver .999 fine in amounts of 50,000 ounces or more for nearby delivery at New York, and is usually one-quarter cent below the price paid for such bar silver, this deduction being the allowance for carrying, delivering and marketing. In addition to foreign silver, the quotations also apply to domestic and Treasury silver if such silver enters into the New York market.

The Treasury's purchase price of newly mined domestic silver is 90.5c. per troy ounce 1000 fine, effective July 1, 1946. London silver, in pence per troy ounce, basis .999 fine.

(d) U.S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

Behind the By-Lines . . .

» **Off we go,** this month, into the wild blue yonder with the pilots and crews of Aero Service Corporation. Compared with the jet-propelled Army Air Force, Aero Service flies very low and slow, indeed, but they usually come up with something a lot more constructive.

In this case, they've come up with a brand new iron orebody in Eastern Pennsylvania. It's a big orebody, and there's no surface indication of it whatsoever. Here's an actual instance of use of the airborne magnetometer to add substantially to domestic U.S. iron ore reserves. Read all about it on p. 56.

Unfortunately, like your local department store on Bargain Day, we are not permitted to mention the famous name of the present owner of this new orebody, but we can't stop you from guessing. Let's just say that the first ten readers who write to us, correctly identifying the company concerned, will get nothing from us but the suggestion that they keep mum.

» **John Huttl,** *E. & M. J.'s* West Coast editor, has done more than any of us, perhaps, to make it tough to convince people that editors lead a hard life.

For example, he flies over to Manila, travels all around the Philippine Islands, visits with friends he hasn't seen in years, stays at a magnificent new hotel, flies back, and calls it working. On top of that, he gets to live in San Francisco, which is about all that a man can ask of life, seems to us.

Seriously though, we know of no one better able than John to visit abroad and bring back an accurate account of the business and political life he saw there. John has lived, or travelled, in every quarter of the globe, and he has seen men at their best, and their worst, in every part of it. Most important, he understands what he sees. We think you'll enjoy John's report on the extremely critical Philippine situation as he saw it during his recent trip. It begins on p. 80. The second part, a report on individual mines, will appear next month.

» **We could look this up,** but it's easier to ask someone else. Anybody remember the next line after,

"It's pay day up at the mines, and the bearded brutes will be down."

It sounds like Robert W. Service, but what poem is it? Anyway, we're sure that the next line does not run,

"After deducting for social security, withholding tax, state unemployment insurance, hospitalization insurance, and pension fund."

Curls *our* beard every time we see our pay check.

» **This is as good a place as any** to mention that we are awfully sorry for crediting A. S. & R.'s new casting wheel to the Kennecott refinery at Salt Lake City, as we did on p. 74 of our June issue. The new refinery does have a Walker wheel for casting anodes, but it isn't that big. The wheel shown is over at Garfield.

Also, we wonder if anyone noticed that "short, fascinating belt feeder" on p. 124 of our July issue. We meant "fast-running," but the printer didn't see it that way. Well, that rod mill feeder *is* kind of fascinating at that.

» **When you get back** to the New Products Digest section, take a tip from us and draw a neat ring around No. 75 on that post card with all the numbers, first thing you do. We tried to get that item away from the NPD editor when it came in, but he's bigger. So we'll just have to send in our post card the same way you will.

» **Over in Brooklyn,** torque is what you do out of the side of your mouth, but in trucking, it's what makes the wheels go around. Earl Farnum, superintendent of mobile equipment for The Hanna Co. up in Hibbing, Minn., has more wheels to keep moving than almost anybody we can think of. He's responsible for 179 big trucks hauling iron ore out of Hanna's pits, some toting 34 tons at a crack.

Naturally, any device that promises to multiply torque would interest Mr. Farnum, and he was among the first to look into the possibilities of the torque converter as applied to open pit trucking. He has completed a long series of tests with torque converters on his trucks, and his conclusions are both interesting and useful. You'll find them on p. 68.

» **It did our already jumpy nervous system** no good at all last week when we came across this little item in the real estate section of our local paper. It offered a house for sale in the routine way, but after the usual glowing references to tile baths and breakfast nooks, came this chilling sentence, "Finished basement, including playroom and bomb shelter." It has been running through our mind all week. Playroom and bomb shelter! Ring around a rosie, and we'll all go boom!

» **Alongside the railroad tracks** on the edge of our old home town, there was, and still may be, a weather-beaten sign asking accusingly, "Where will you spend eternity?"

Well, we have never personally been able to answer for more than the next couple of hours, but there are men made of sterner stuff who can look ahead for a good many years, if not for eternity. Like Sam Lasky of the U.S.G.S, for instance.

Already dubbed "Swami Sam" by his associates for an earlier work *(E. & M. J.,* April, 1950), Mr. Lasky is waiting with breath properly bated for your reaction to the article that begins on p. 60, this issue. It is a sincere, thoughtful attempt to apply to the mining industry the same growth-and-decay statistical data that have been found to govern practically every form of human activity.

You're going to be startled by his conclusions, but don't pooh-pooh them. The last laugh may be Lasky's. Those skeptics who checked his first article (on predicting tonnage and grade of orebodies) against their own experiences, found his ideas worked.

ENGINEERING AND MINING JOURNAL

AUGUST, 1951

Selective Subsidies Are Dangerous

THE PEOPLE WHO WANT to separate the mining industry into sheep and goats price-wise are playing with dynamite.

Two-price-ism first entered the mineral picture when the Premium Price Plan was devised, primarily because the economists who dominated OPA in World War II were horrified at the concept of handing Government money to large corporations already making profits. During the war it also entered into our foreign purchases.

One can sympathize, if not agree, with the marginal producers who desperately sought to stay in business after the war and were willing to sponsor two-price-ism because they could not imagine Congressional willingness to spread the benefits across the board.

Selective (over-quota) subsidies have appeared recently in two areas. When the 5-year guaranteed floor price in tungsten was developed, General Services Administration insisted on cutting down the size of the bill by limiting the benefits to over-quota production. This scheme was quickly perceived to be inequitable and was dropped. More recently, with influential sponsorship, the Minerals Advisory Committee endorsed the principle of over-quota subsidies, zinc being the commodity uppermost in mind at the time. This grew out of the belief that subsidies were needed under the circumstances and that Congress would not foot the bill for equal treatment to all.

If we were ambitious or socialistic bureaucratic empire builders, we would consider selective subsidy power the perfect tool to attain domination over the mining industry. This would give us purse-string power over a large segment of the industry and create a cleavage which could be manipulated to set elements in the industry against each other.

As a people, we accept the premise that power to tax is power to destroy, but, through inexperience, do not yet realize that the power to subsidize selectively is even more potent.

The case against a selective system is simple, but compelling, to those who wish to preserve the vitality and efficiency of the minig industry by keeping it a private enterprise area. Here it is:

1. The inequity of preferential treatment to the fellow who holds back until he is suitably baited is intolerable.

2. Correction of this obvious inequity would open the door to meddlers, which in this Government means that the system would be gradually altered into an anti-profit mechanism and a device for encroaching control.

3. Incentives would be set up for operators to slight established mines in favor of new enterprises or to invent unnatural developments that would qualify for assistance. All mining is constantly new to the extent that extraction changes the situs of work. Thus it is impossible to make a clear distinction setting new production apart.

4. The labor force would be dislocated, with a loss of overall productivity. Unnatural competitive bidding for a limited labor supply would create new situations calling for new adjustments.

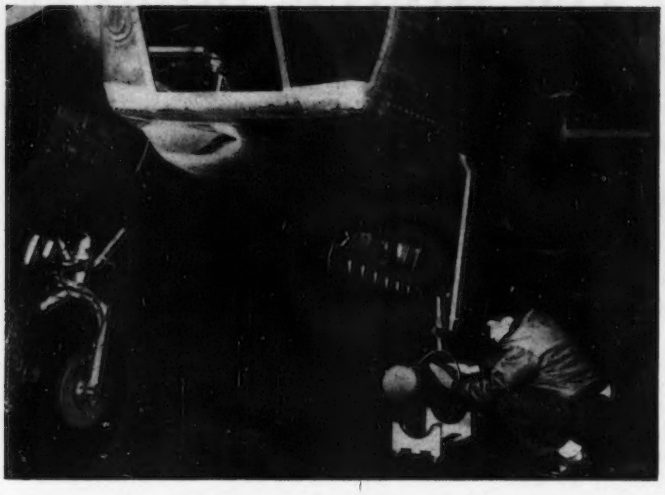
5. As under the Premium Price Plan, managements would compromise their bargaining position in the expectation that the bill could be handed to Government. The concept of collective bargaining in the public interest breaks down if management abdicates.

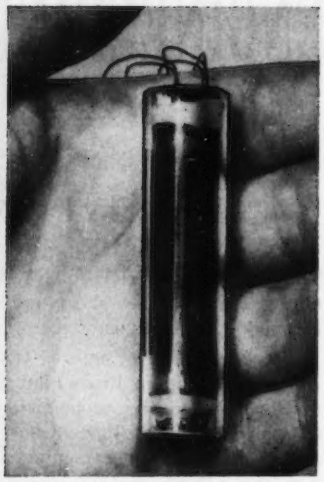
6. To distinguish price-wise between identical units of the same commodity is illogical, and tends to create ever-new problems, to be met by a constant stream of new regulations.

7. Success in mining would gradually reflect the effectiveness of a case made before a bureaucratic tribunal. Mine managements would do most of their "mining" in Washington and less where management belongs—on the property doing a better job every day.

Therefore, for the sake of the industry and its future, we condemn any subsidy arrangement which distinguishes between identical units of the same mineral product. We prefer to sell Congress on the more expensive method, if subsidy is deemed worth while, of treating all units alike—not so expensive after all in an excess-profits tax period—and to keep the industry in private hands. Bureaucracy simply cannot run the mining industry efficiently and in the long run the public would suffer the consequences.

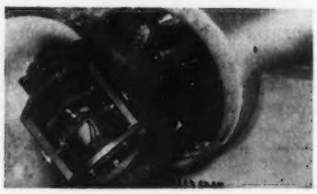
The Airborne Magnetometer Used in the Survey . . .





SENSITIVE ELEMENT, actual size.

THE MAGNETOMETER. Here is a close-up of the plane and magnetometer used in the magnetic survey. Crew member above is attaching the cable-mounted magnetometer which will trail like a bird 70 ft. below the plane while in flight. The tiny sensitive element shown at right instantly picks up slight variations in magnetic field intensity—as little as 1 or 2 gammas. This element in turn is mounted in the head of the magnetometer, and must at all time be oriented parallel with the earth's total magnetic field. Constant and proper orientation is maintained by an ingenious gimbal mount in the head of the magnetometer which is operated by servo mechanisms responding instantly to undulations in the magnetic field traversed by the magnetometer while towed in flight.



HEAD of airborne magnetometer.

Airomagnetic Survey Helps Find New Pennsylvania Iron Orebody

ADVENT OF THE AIRBORNE MAGNETOMETER only a few years ago (E&MJ June, 1946) aroused high hopes that mineral exploration would be tremendously aided. These hopes have been realized, and here is but one example—the discovery of a new large blind iron orebody in eastern Pennsylvania. The 900,000-acre air survey leading to the discovery was made at a cost of less than 7¢ per acre. Details are released through courtesy of the progressive mining company which made the recent important discovery.

HOMER JENSEN
Chief Magnetometer Section,
Aero Service Corporation,
Philadelphia

THE AIRBORNE MAGNETOMETER recently discovered an important new iron ore deposit in a blind area in eastern Pennsylvania. The air survey located a massive magnetite body overlooked in many past ground studies. The body is at a depth of 1,500 to 3,000 ft., and no surface expression is apparent.

Extent of aeromagnetic survey was 900,000 acres. Flown by Aero Service Corp., its cost was less than 7¢ per acre.

Many years of ground exploration in this part of Pennsylvania have yielded many discoveries of minor bodies but no really important larger ones. Since the ore to be expected in the area was magnetite, a highly magnetic ore, the use of the magnetometer was indicated. The aerial survey instrument was chosen for six reasons:

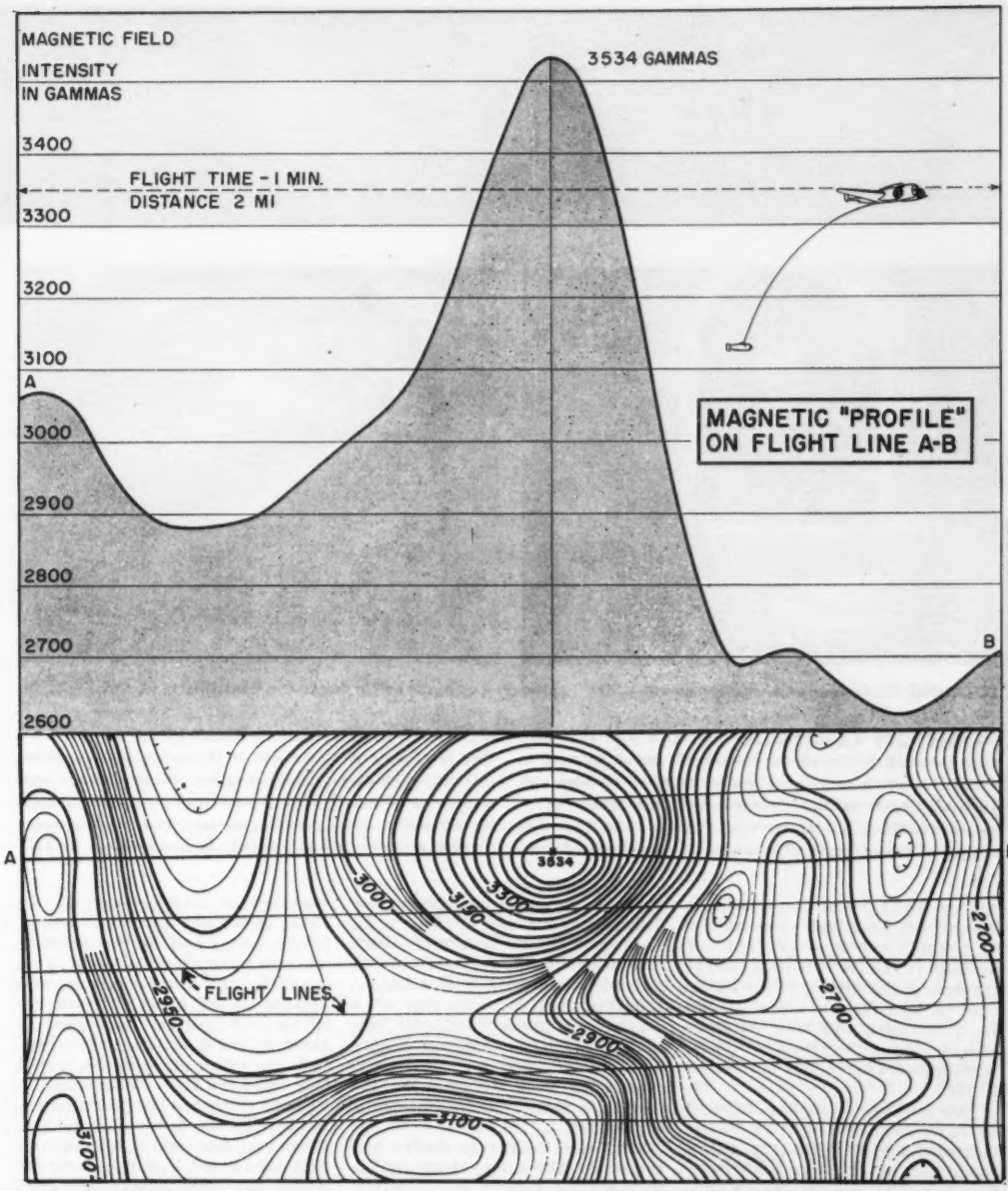
1. High sensitivity
2. Continuous record
3. Freedom from surface accidentals
4. Speed and detail
5. Successful exploration record
6. Conclusiveness of its surveys

The geologists knew that only the aerial survey permits a quick, broad, conclusive search. The ground studies had been scattered and inconclusive, with gaps caused by terrain difficulties and property considerations.

Three preliminary magnetometer

(Text continued on page 58)

. . . and What It Revealed



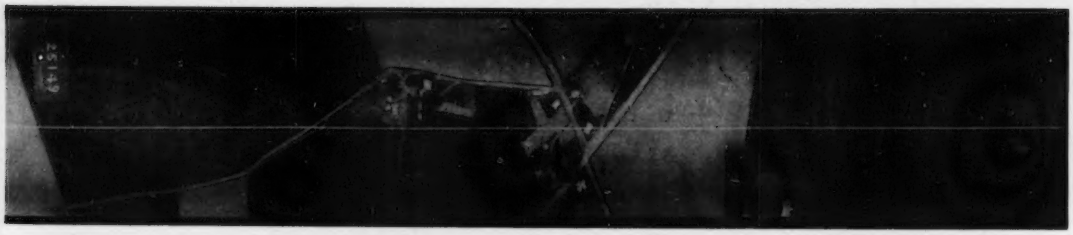
THE ANOMALY. A magnetic peak, such as this over an iron ore deposit, was picked up by the airborne magnetometer and registered on a continuous tape in the exploration plane. Magnetic peaks comparable to this enabled geologists to determine quickly where to diamond drill for ore. The new deep iron ore deposit in eastern Pennsylvania, with virtually no surface expression, was discovered in this manner—also a hidden iron ore deposit in southern Ontario.

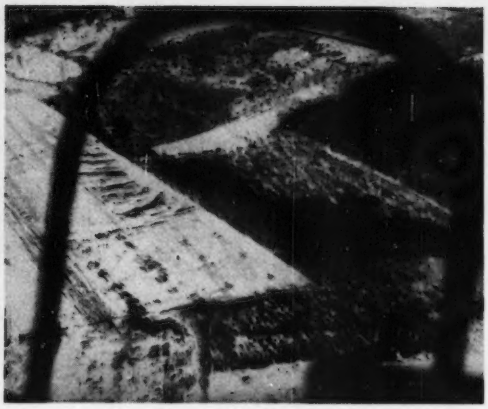
The isogam* map above, showing magnetic field intensity in gammas over a favorable area, was compiled from magnetic profiles obtained by the exploration plane as it flew over the area along flight lines indicated on the map.

Flight elevation was maintained steadily at 500 ft. The problem of correlating the continuous magnetometer tape recording precisely with plane position is an important technical detail in airborne surveys. This is explained on the following pages.

* NOTE: The gamma is a unit of intensity used to measure the earth's magnetic field. Total field intensity on the earth's surface varies from 25,000 gammas at the equator to 70,000 gammas at the magnetic poles. It is obvious, therefore, that the Gulf magnetometer used here which detects differences of 1 to 2 gammas is extremely sensitive.

Continuous Strip Film Records Plane Position and Radio-Altimeter Chart





LOOKING IN on the photographer-co-pilot . . . and what he sees through the plexiglass nose at 500 ft.

POSITION CONTROL. Accurate magnetic profiles recorded by magnetic equipment would be useless without precisely correlated records of plane position and altitude. Plane position is recorded continuously by a gyroscopically-stabilized camera taking a strip film. See sample at top of page. (The shutter never closes. Details are described in E&MJ, Aug. 1946.) Flight traverses are then located on photomosaics of the entire area explored, thereby establishing plane position. Plane altitude was recorded continuously on tape shown on right. The problem of correlating plane position, altitude, and magnetometer reading periodically and precisely is accomplished by fidu-

survey flights were made over a known magnetic body—one at 300 ft. altitude, one at 500 ft. and one at 1,000 ft., all flown with the flight traverse perpendicular to the structure. A satisfactory signal at 500 ft., a convenient and safe operating altitude, led to the choice of 500 ft. terrain clearance as the normal altitude.

This survey, which was flown in 30 days, soon recorded significant magnetic highs. Often the signal would vary as much as 5,000 gammas in a few seconds. These anomalies, which stood out on the record like sore thumbs, were not all commercial orebodies. However, they did reflect differences in subsurface structures. It was necessary to correlate the geologic information in the field with the magnetic data to ascertain the significance of the magnetic record.

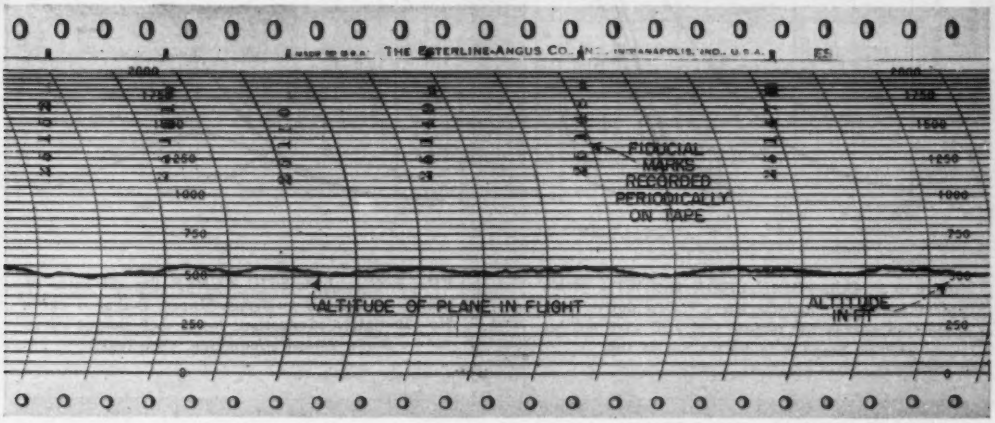
It has been established that the aerial survey uncovered a massive concentration of magnetite in the Paleozoic limestone underlying the Triassic sediments of this area. This body produced a very direct indication in the magnetic record. Subsequent diamond drilling has established that the body lies at a depth of 1,500 to 3,000 ft. with virtually no surface expression. General information was soundly enough established from the magnetic information alone to permit property acquisition.

How was the survey staffed and executed? The survey plane was a twin-engine Beechcraft, specially outfitted with complex electronic recording equipment. A stable, workhorse craft, it has been used extensively in surveys in the United States and Canada. A twin-engine craft is always chosen for low-altitude aeromagnetic work because an engine failure in a single-engine plane at 500 ft. is not healthy.

The magnetometer employed was the high sensitivity instrument pioneered and developed by the Gulf Research & Development Co. in 1947. Tested and improved through better than a half million miles of oil and mineral exploration, it is especially useful in mineral surveys because of its great speed of response. The survey plane moves along at about 200 ft. per second, and the range of magnetic signal may be 10,000 to 15,000 gammas in a short distance. The Gulf instrument responds dependably to this great variation, and it is connected to a Leeds and Northrup recorder which has been adapted to keep pace with the rapidly changing peaks and valleys of the magnetic signal. This basic magnetic record is the key to the survey success; unless it is made precisely and rapidly, the magnetic figures become attenuated and generalized and their significant differences are lost.

The survey plane's terrain clearance was indicated and recorded continually with a special RCA recording radio-altimeter, and every

Records Height of Flight



RECORDING ALTIMETER shows how close to 500 ft. flight elevation is maintained by survey pilots.

cial marks (key numbers) which are stamped on all three recordings simultaneously and automatically. Thus at any instant—say when No. 21549 (above) was stamped—the plane position, altitude, and magnetic profile were perfectly correlated. Photomosaics, referred to previously, were adjusted to correspond with existing Coast and Geodetic Survey, and U. S. Geological Survey topograph maps of the area. Thus the strip film of flight paths was tied accurately to available and reliable topographical maps of the area explored. With magnetic and plane position data such as this, a magnetic contour map (with 10-gamma interval) was prepared for the area surveyed in Pennsylvania.

foot of the flight path was recorded with a "Sonne" camera. This gyro-stabilized strip camera photographs the flight path on 35 mm. film. (See sample shown above.) Approximately 5,000 ft. of film were used to record the 5,600 linear miles flown in the survey. At frequent time intervals the Sonne strip film and the magnetometer record tape are stamped with a fiducial mark, so that the magnetic record and flight path are clearly correlated.

The survey flight lines were laid out at ¼-mile intervals roughly at right angles to the regional strike, on existing topographic maps obtained from the U. S. Coast & Geodetic Survey and the U. S. Geological Survey. These lines were transferred to photo-mosaics, which were used for actual flight guidance, and for identification of the flight path photographs. The survey was flown in midwinter without incurring difficulties or unusual delays due to weather or snow cover. Aeromagnetic surveys are often executed during the winter months, with correlating ground studies planned for spring and summer work.

The survey crew consisted of a pilot, co-pilot photographer, and magnetometer operator. They took off each day soon after daylight and on second flights often flew till almost dusk, covering as many as 100,000 acres in a single day. Each night the Sonne film was developed and inspected and the magnetometer and altimeter records checked.

Geologists studied the day-to-day results of the survey, for in a search for so strongly magnetic a mineral, the "raw" magnetic data is often significant. (In aerial studies of structures where the target is not so strongly magnetic, the field work would wait for the magnetic intensity maps to provide a broad picture of trends within the area.) The magnetic maps are compiled usually at 5 or 10-gamma contour intervals 'n mineral surveyed, though Aero Service has compiled a dependable 1-gamma map. The Pennsylvania survey was compiled at a contour interval of 10 gammas at a horizontal scale of 2 inches equal 1 mile. Final delivery was made in four months, though most of the client's geological work had been completed earlier, using the data in a preliminary form.

Similar Find in Ontario

Like a similar discovery in southern Ontario, this new orebody was discovered on the fringe of a known or probable area. Today, when there is a growing interest among mining companies in blind areas contiguous to known deposits, the aeromagnetic method makes it feasible to canvass such areas rapidly, economically and conclusively. It appears that a number of mining companies will use this tested new exploration tool to do this.

The Curves That Chart Nearly Every Kind Of Activity. . .

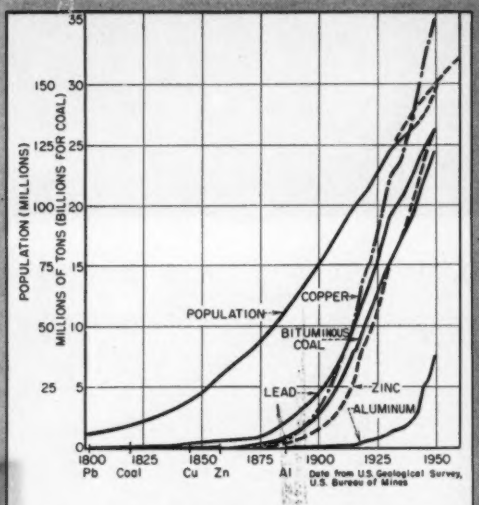


FIG. 1. . . . U.S. POPULATION GROWTH yields typical S-shaped "logistic curve." Cumulative U.S. production curves for metals and coal give similar curves; trend is to flatten out at top.

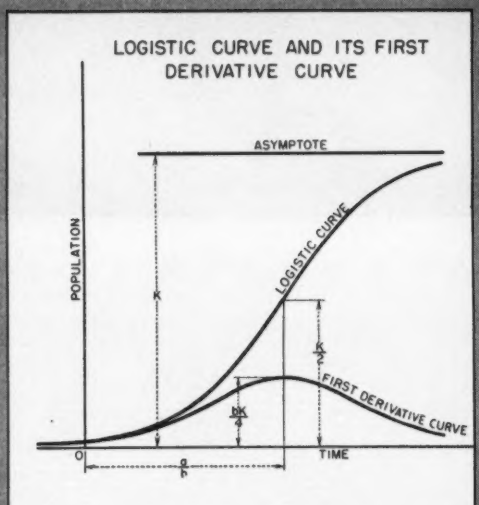


FIG. 2 . . . LOGISTIC CURVE fits all sorts of growth and decay patterns. Upper, S-shaped curve fits cumulative production; lower, bell-shaped curve shows annual production. (See text.)

Mineral Industry Futures

Everyone interested in mineral industry activities has an eye on the future. Large operator or small, producer, consumer, or investor, each wonders where his industry is headed. Mr. Lasky's study is a valuable aid in planning for the future, and we are proud to present it. — The Editors.

S. G. LASKY
Department of Interior, Washington, D. C.

THE MINERAL INDUSTRY—indeed, every industry—has a compelling interest in the future, particularly in these days when the future is apparently going to make unprecedented demands. Unfortunately, there is no way of actually seeing into the future, but we have learned that the trends of the past and present can be used to give an appreciation of it. In mineral studies the usual way of determining and applying trends has been to estimate and project them on the basis of simple inspection of the record, supplemented by a few rule-of-thumb statistical techniques.

The long-term planning required by a growing country in a shrinking world demands a better method for peering into the economic future than the mineral industry has used in the past. This paper is believed to offer an improvement. Its thesis is that a mineral industry grows and decays according to a systematic pattern controlled by the progressive mutual adjustment of all the political, economic, and technologic factors peculiar to it. The peaks and valleys of production represent no more than temporary deviations from the general trend of growth. Upon this assumption the growth trends of five domestic industries have been calculated according to the pattern of growth expressed by the particular curve known as the logistic curve or equation. Other growth curves could have been used, but the logistic curve is perhaps the most useful and expressive. The closeness with which the calculated trends fit the recorded facts of production, rates of growth, and export-import relations, engenders the belief that

. . . Can Also Plot The Probable Course Of Mining

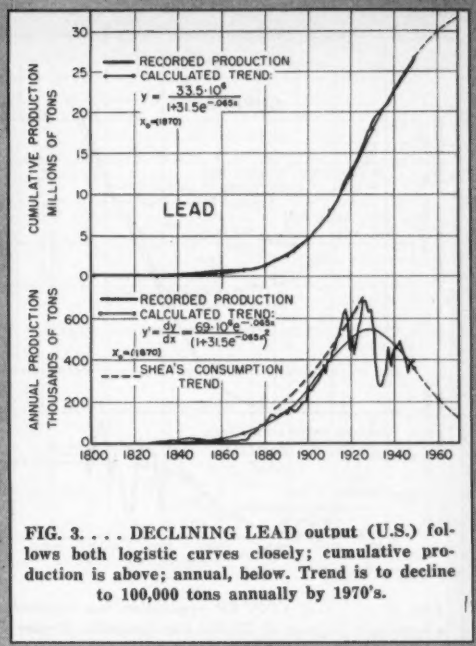


FIG. 3. . . . DECLINING LEAD output (U.S.) follows both logistic curves closely; cumulative production is above; annual, below. Trend is to decline to 100,000 tons annually by 1970's.

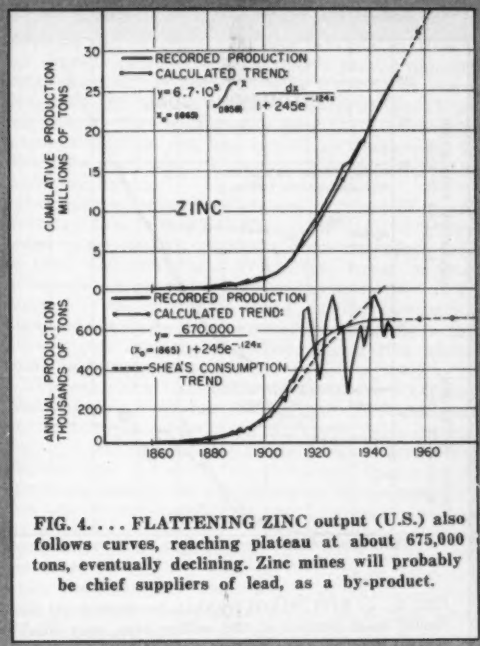


FIG. 4. . . . FLATTENING ZINC output (U.S.) also follows curves, reaching plateau at about 675,000 tons, eventually declining. Zinc mines will probably be chief suppliers of lead, as a by-product.

Can Be Predicted[1]

these trends express reality. To the extent that they do so, they thereby provide a better basis for considering the future than would, let us say, personal conviction or trends based only on surmise or impression; if history should prove them wrong, then it is up to us to continue to search for a better guide.

A concept common among business economists is that industries and businesses, like living organisms, follow cycles of growth and decay. This point of view appears also in the mining literature.[2] Readers of this paper who are acquainted with the mathematical expressions of growth and decay know that these expressions have had wide application in chemistry and biology for many years. One of best known and most useful is that known as the logistic curve. Originally derived as a means of describing the growth of human populations,[3] it has been found, because of its extreme mathematical flexibility, to be useful in the study of any problem (including economic growth) in which an activity starts slowly, speeds up, and then slows down. The way in which the logistic curve mathematically embodies the characteristics of industrial growth was described at least as far back as 1930 by S. S. Kuznets.[4] In slightly more complicated form (see figure 5, this paper), the logistic curve has even greater utility and adaptability than described by Kuznets.

The cycle of activity characterized by slow start, speed up, and eventual slowing down would seem to be clearly characteristic of the average mineral industry. At the risk of over-simplifying a very involved problem, for the purpose of the present discussion, we may list the following as among the factors that influence growth in these industries:

1. Political climate—i.e., the relation between government and industry.

2. Demand. Demand itself is compounded of many elements: the integrated over-all economy of the

[1] Publication authorized by the Director, U. S. Geological Survey. The opinions expressed in this paper are those of the author and do not necessarily reflect the official position of the Geological Survey.

[2] See, for example: Hewett, D. F., "Cycles in Metal Production," A.I.M.E. Trans., vol. 85, pp. 65-92, 1929; Shea, W. P., Long-Term Demand Will Force Metal Prices Up, *E. & M. J.*, vol. 151, pp. 81-83, March 1950; Leith, C. K., Mineral Valuations of the Future, pp. 52-64, A.I.M.E. Trans., 1938.

[3] Pearl, Raymond, "Medical Biometry and Statistics," 3d ed., p. 459, W. B. Saunders Co., 1941. C. C. DeWitt, "Correlation Of Rate Data," *Ind. & Eng. Chem.*, v. 35, p. 695, 1943. H. T. Davis and W. F. C. Nelson, "Elements Of Statistics," pp. 244-251, Principia Press, 1937.

[4] Kuznets, S. S., Secular Movements in Production and Prices, pp. 60-69, Houghton Mifflin Co., 1930.

Two Industries Now On The Plateau Of Development. . .

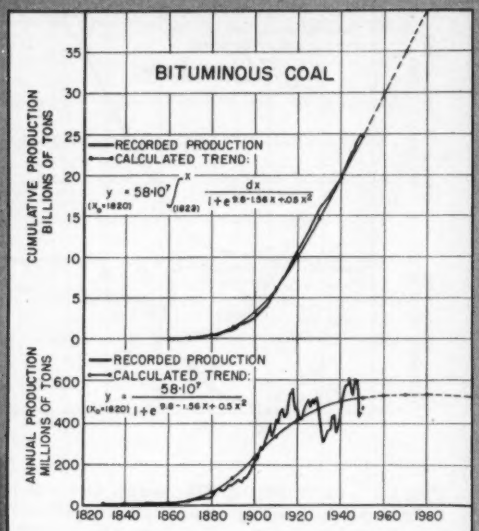


FIG. 5. . . . BITUMINOUS COAL production (U.S.) should reach plateau at 550 million tons, stay there several decades, then decline as competitive sources of energy offer cheaper power.

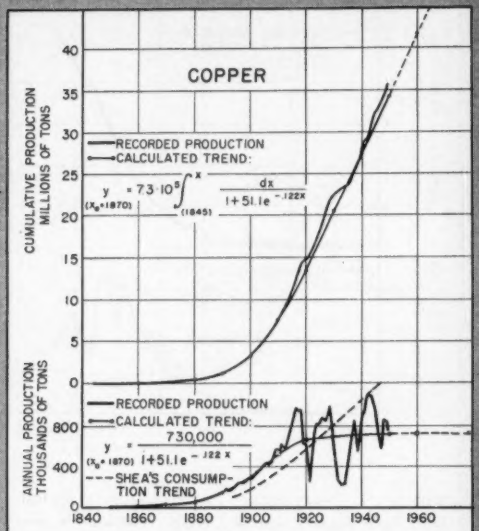


FIG. 6. . . . U.S. COPPER production has reached a long-term plateau of 750,000 tons annually. Higher consumption rates hereafter must depend on imports and scrap as domestic output flattens.

country, a population changing in both quantity and quality, purchasing power and per-capita consumption, availability of foreign supply, competition from substitute materials, and other factors.

3. Number, size, and quality of the deposits in the ground.

4. Ability to find these deposits.

5. Technologic progress.

The most stimulating growth factors are a growing population and a growing per-capita demand. The decay factors are the finite number of deposits in the ground, the increasing difficulty of finding them, and competition from substitutes. Political climate may stimulate either growth or decay.

All the factors are continuously present, the seeds of decay (as in a living organism) being present even during periods of healthiest growth. Moreover, each factor itself has been following its own pattern of change over the years. The political philosophy of the United States is gradually changing, our population is growing, and per-capita demand for metals is also growing. So are technologic progress and competition from substitutes. On the other hand, our minable deposits become progressively fewer as we find and mine them out. And the job of finding them is becoming more and more difficult. We cannot determine or predict, for a given future time, the status or effect of each factor, but perhaps we can predict the trend of the net result of them all.

A few examples will illustrate the ideas expressed above. I have five in mind: the domestic lead, bituminous coal, copper, and zinc mining industries and the domestic aluminum industry. The first is an industry that is well into the period of decline; the next two are just reaching the peak of productivity; the last is young and its growth is still accelerating. Zinc is included because it is needed to help interpret the case for lead.

Before considering these examples, however, it will be profitable to examine briefly the general pattern of growth among the mineral industries and the general nature of the logistic curve. Figure 1 shows the curves of cumulative production as plotted from recorded data for the examples chosen. The United States population curve, a type example of the logistic curve,[5] is also shown. It will be noted that although the effects of recent wars, booms, and depressions are recognizable, these events, drastic as they were, have not altered the growth pattern in general.

Figure 2, a diagram of the simple logistic curve, is one of Raymond Pearl's. In terms of mineral production, the S-shaped curve—marked the logistic curve—is the curve of cumulative production; the bell-shaped curve is the curve of annual production. The two curves are derivable mathematically one from the other and constitute an inseparable pair. Only one of the two need be calculated from the raw data, the other being obtained from the first by simple calculus. The closeness with which the second curve fits the factual record is thus a measure, statistically, of "the goodness of fit" of the first

[5] Pearl, Raymond, op. cit.

. . . And One Still Accelerating

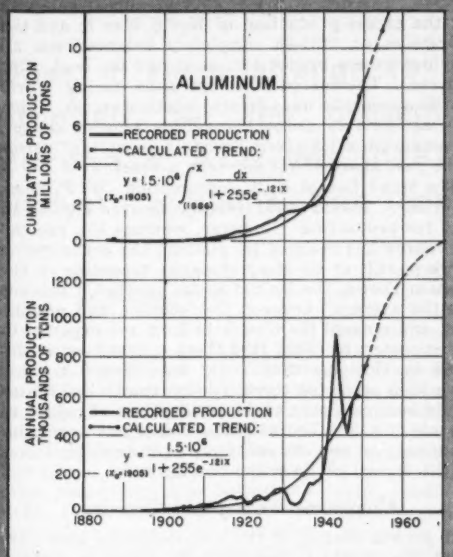


FIG. 7. . . . U.S. ALUMINUM output should grow to 1.5 million tons annually to reach plateau stage of coal and copper, perhaps by 1980. Industry's growth has followed logistic curve.

curve. For example, in figure 5 the trend of annual zinc production was calculated from the year-by-year data. The cumulative trend line was then calculated from the annual trend line, and the extraordinary fit between it and the factual cumulative curve substantiates the calculated annual curve.

Lead on Decline, Zinc Flattening

The statistical record of lead production in the United States began in 1801. Thus we have a record of nearly 150 years to be examined for trends of growth and decay. (See fig. 3.)

Lead production in the United States appears now to be in a third cycle. The first cycle ended in 1826. One reason suggested for this change is that the building of canals in the East opened up markets by creating a transportation system. Prior to that time, production approximated 1,000 to 2,000 tons a year. The second cycle extended from 1827 to 1870; production reached a peak of 30,000 tons in 1845 and then declined to a low rate that remained roughly constant for a long while.

The third or present cycle got its start presumably with the opening up of new markets and frontiers and the opening of Western deposits to exploitation by virtue of the completion of the transcontinental railroads. Annual production rose steadily and rapidly, with a slack period between about 1885 and 1895, until it reached 651,000 tons during World War I. It zoomed even higher during the boom of the mid-20's. As viewed in long-term perspective, the peak of the current cycle was reached in 1928, at an average value of 550,000 tons a year. From then on production has been following a declining course. Not even the frantic demands of World War II, and the equally frantic efforts to meet them, could raise production from its low in the depression of the 30's to a point much higher than indicated by that declining course.

In terms of cumulative production, the lead-mining industry has followed a calculable logistic growth trend quite closely, particularly in the years prior to 1914. The demands of World War I and the boom of the 20's created production in excess of that indicated by the calculated trend, but this excess was balanced out in the depression of the 30's. The factual growth line and the calculated trend line almost coincide for the years since.

The calculated trends imply that, short of some extraordinary vivifying development that will start the industry on a new cycle of growth, mine production will be down in two or three decades to about 100,000 tons annually. At that rate lead may be produced mainly as a by-product of zinc mining. The maximum capability of the American zinc-mining industry, on long-term balance or average, is at about 675,000 tons annually. (See fig. 4.) The average ratio of zinc to lead for the major lead-zinc producing districts is about 6 to 1, so that by-product lead production from them would be a little over 100,000 tons a year.

The calculated trends imply also that, unless a new cycle develops, the total lead to be produced from United States mines will be on the order of 35 million tons, rather less than more. This figure is in accord with the available data on reserves. Reserves of recoverable metal were estimated at 6.6 million tons at the beginning of 1944. Production through 1943 aggregated 24.1 million, giving a total of roughly 31 million for that date. Thus the estimate of 35 million allows for discovery of 4 million tons of lead after 1944. This is equivalent to 100 million tons of ore.

It appears that for the near term—the next decade or so—mine production can be expected to average between, say 300,000 and 350,000 tons a year. Production in 1949 was 404,000 tons. Demand may keep it up around some such figure for some time, but the longer it stays up, the lower it can be expected to go eventually in order to average out. It may well drop to 200,000—a figure lower than anything since 1898.

Figure 3 shows the consumption trend as calculated by W. P. Shea in the March 1950 issue of this journal. According to the two trend lines, the United States became unequivocally a net importer about 1920. Moreover, consumption is still increasing rapidly, while mine production continues to decline. The conclusion is inescapable: The United States can expect increasing reliance on imports and scrap at a compound rate. For zinc, as indicated by the calculated trends, the United States, on long-term balance, became a net importer in the early 30's.

Coal—A Long History

The case for lead (with side reference to zinc) has been discussed in some detail in order to illustrate the determination of trends and the concept of growth and decay. Accordingly the examples for coal, copper, and aluminum can be treated briefly.

Bituminous coal ought to be a good commodity

to study. Not only does it have a long statistical record, starting about 1820, but as a fuel it may be assumed to have been especially related to the growth of the nation. If there is such a thing as systematic growth among the mineral industries, tied to growing population, industrialization, and technologic competition, coal ought to show it.

As in the history for lead, there was a slackening in annual coal production about 1890; and then just before 1900 there was a large average-by-year increase that persisted to the peak production year of World War I. (See fig. 5.) There is, however, a notable difference between coal and lead (or copper). Whereas lead and copper had a greater annual increase in production during World War I than for the preceding years, coal had a slightly smaller increase.

In terms of cumulative production, the surplus over calculated trend persisted, as with lead, until the depression of the 30's. Since then, cumulative production and long-term trend have been virtually identical.

The projected trend lines indicate our average expectation for the future. According to the trend line of annual production, the plateau is at about 550 million tons. The industry is now close to that level, and despite technologic competition on the one hand, or growing demands for energy on the other hand, it can be expected to stay there for a number of decades. Annual production may be greater or less than 550 million for long stretches of time, but it can be expected to average out at that figure.

We often hear the statement that the coal industry has priced itself out of a market. The implication is that the loss of markets to competitive sources of energy could have been avoided. Might we not also consider that today's position is the necessary result of factors that have been at work for a long time and that are beyond the control of the coal industry?

Copper—On a Plateau

The American copper industry can be said to have started with the beginning of organized copper mining in Michigan. That was in 1845. The industry and its statistical record thus give a 105-year span of the past from which to estimate the present state of growth as a clue to the future. (See fig. 6.)

Neither discovery of new deposits nor technologic developments have had any noticeable effect on the growth trend of copper. For example, the first porphyry copper deposit—a type which now yields more than two-thirds of domestic production—was brought into operation in 1906, but there is no indication of that fact in the growth records. It would seem that we simply found new ore or improved our mining and metallurgical technology as needed.

From 1845 to 1914 (70 years) the annual production record followed a logistic course as closely as though foreordained. Annual production accelerated steadily until 1903, after which the rate of growth began slowing down. Absolute production continued to increase, of course, from an average of about 350,000 tons a year to a present average of about 725,000 tons.

The calculated trends for copper are based on data no more recent than 1912, so that their projection to 1950 constitutes prophecy for four decades. Cumulative production to the present time pretty closely averages out the excesses of World War I, the boom of the mid-20's, and World War II, together with the deficiencies of the depressions of 1921-22 and 1931-35. The depression of 1921-22 almost balanced out the excess production of World War I; and the depression of 1931-35 completely balanced out all previous excess production, as it had for lead, zinc, and coal. The forced-draft operation during World War II appears to have created another excess, which now amounts to about 1½ million tons of copper. In general, the long-term "production ceiling" seems to be just short of 750,000 tons a year.

The trend line of U. S. consumption (W. P. Shea, *E. & M. J.* March 1950) follows a curve similar to that for production. However, whereas the production curve has reached its plateau, the consumption curve is still at its steepest part. According to the relation shown, the United States reached a balance (on the average) between consumption and production, and crossed the threshold from net exporter to net importer, in 1925. Had these curves been calculated in 1912—as they could have been—it could have been predicted correctly that the United States would become a permanent net importer of copper in the mid-20's. The United States can expect to rely increasingly on imports and scrap at the rate indicated by the spread between the two curves.

Aluminum—Young and Growing

If growth studies of the kind described above are valid, they ought to be especially useful in contemplating the future of industries that are still relatively young. The aluminum industry should be a good test case.

Aluminum metal was not isolated until 1825; it was not even named until 1812. The first commercial production in the United States was in 1886, immediately after the discovery of the electrolytic process by Hall and, independently in France, by Heroult. The Bayer process for the production of alumina from bauxite was discovered in 1888. The young industry was still trying to establish a market for itself when it was caught in the turbulent period of history that began in 1914.

Figure 7 shows the results of applying the logistic growth concept to the aluminum industry. Despite the fact that the later life of the aluminum industry has coincided with a period of abnormality, its growth trend during that period seems to be projection of the path followed in the preceding years. Evidently the elements that have controlled its growth have been inherent from the beginning.

The current annual production of about 600,000 tons can be expected to increase to an average of 1½ million tons before the industry reaches the stage of growth that the copper industry is in now. That point will probably be reached in the 70's. This prophecy, of course, makes no pretense of accuracy; it simply indicates the order of expectation.[6]

In making these studies, I am genuinely indebted to a number of colleagues and acquaintances for discussion and criticism, as follows: W. G. Schlecht, F. G. Wells, E. T. McKnight, H. M. Bannerman, Olaf N. Rove, T. S. Lovering, and others in the Geological Survey; H. J. Barnett of the Program Staff, Department of the Interior; and Y. S. Leong, Ezra Glaser, and Raymond Nassimbene of the Budget Bureau.

[6] This prophecy is particularly interesting in view of announced plans to bring aluminum production capacity up to totals ranging from 1,450,000 to 2,200,000 tons annually as part of the current defense program. If the author is correct, capacity over 1,500,000 tons will be derelict—unless the surplus is dynamic enough to "kick off" a new growth cycle—The editors.

Silver Marks Time

Does it seem strange to you that the silver users have dropped, for the present, their attacks on the Silver Purchase Act? Mr. Bratter, experienced monetary analyst, explains this and other silver market aspects.

HERBERT BRATTER,
Washington, D. C.

SILVER IS NEVER a politically dead issue in Washington. The market for the metal is too much dependent on existing silver purchase statutes, policies of the Treasury, regulations of the Office of Price Stabilization, and actions by the governments of other countries such as Mexico and Cuba. In the Capitol the watchdogs over silver never close their eyes entirely, and let out soft growls every now and then, just to warn off intruders. Despite occasional criticism from silver users, no movement for repeal of the silver laws is in evidence. The two antagonists —the users and the sellers—seem willing to accommodate themselves to the status quo, with perhaps minor adjustment in OPS regulations.

The OPS ceiling is what determines today where most of the domestic newly-mined silver is sold: whether to the assured market at the mints at a guaranteed price of 90.5c. a fine ounce, or elsewhere. Some industrial interests would be satisfied if the OPS ceiling on domestic silver were raised just a little higher above the floor which domestic silver is guaranteed by the 1946 law. If the price ceiling determines where much of the new silver goes, it indirectly influences the supply available to industry.

Industry and Domestic Silver Price

Industrial users of silver would like to see a change in the OPS ceiling price, which since January 26, 1951, has been frozen at 90.41c. per ounce 0.999 fine,—the equivalent of 90.5c. per fine ounce. Since the visible supply of foreign silver is insufficient to meet prospective industrial demand in this country, silver users must bid for domestic newly-mined or any surplus Treasury silver which may be available.

The supply of free Treasury silver, as noted elsewhere in this article, is limited. The Treasury has established a selling price of 91c. per fine ounce for such silver and the metal is available at that price in New York. Since most of the domestic newly-mined silver which comes to the Treasury comes to it in the West and is not tendered to the Philadelphia Mint, there is some question as to how long the Treasury will continue willing to offer silver in the East at the 91c. price. Moreover, processors claim that the OPS ceiling bars them from buying Treasury silver at 91c. an ounce because the regulation requires the processors to absorb for their own account anything they pay for silver in excess of 90.41c. an ounce 0.999 fine. Since the processors customarily charge only for fabrication, they would lose money on silver bought from the Treasury.

Normally, only about one-fourth of the domestic mine production is refined in the East. Because of freight costs, silver refined in the West is tendered to the mints at Denver and San Francisco. Silver refined in the East is normally tendered to the Philadelphia Mint. All such silver brings 90.5c. per fine ounce under the 1946 law. Since silver is refined in the New York area it might appear more advantageous to offer it in the New York market, rather than send it to Philadelphia. But it is stated that certain additional costs of selling on the open market still tip the balance in favor of the Philadelphia Mint. Only a small amount of domestic silver, therefore, is being offered on the New York market.

Foreseeing an imminent shortage of industrial silver, spokesmen for the users for months have urged the OPS to raise the ceiling slightly by an amount sufficient to enable consumers to absorb the freight and other costs involved in sending Western-refined silver to the East as well as Eastern-refined silver to the New York market. Whereas at present 70% of all newly-mined silver acquired by the Treasury is monetized and only 30% goes into the "free" account, the suggested change in the OPS ceiling price will enable users to acquire the entire domestic output, it is argued.

Supply-Demand Situation

According to New York sources the consumption of silver by American industry in 1951 is likely to exceed or at least equal the 120 million ounce rate of 1950. Foreign stocks available for sale here are limited, and the Western Hemisphere exclusive of the USA produced last year only 93 million ounces. Mexico, having announced a large-scale coinage program, may be a buyer. Also that country has been seeking coinage orders from abroad and recently sold 17 million ounces of silver to Saudi Arabia. If American users continue restricted as to the price they may pay, they may find themselves unable to compete with world demand for the available supply, it is stated by those who want the OPS ceiling raised.

U. S. Treasury Sales

The Treasury is at present empowered to sell silver by the Act of July 31, 1946, which is an extension with modifications of the Act of July 12, 1943. With certain provisos, the 1946 act authorizes the Treasury to sell or lease for manufacturing uses any silver held or owned by the United States at not less than 90.5c. an ounce. This law provides a floor but no ceiling at all. Note that the Treasury is authorized, but not directed to sell silver. One of the provisos is that enough silver must be held in Treasury possession or control to secure all outstanding silver certificates. It is also noteworthy that the Treasury, quite apart from the 1946 law, has the power to call in silver certificates and convert the stand-

ard silver dollars so released into bullion, which it then could sell. By selling silver in substantial amounts the Treasury could hold down or even depress the price of the metal; and under certain circumstances, by refraining from selling it could contribute toward an increase in the price. The Treasury's powers to sell silver therefore constitute a major potential influence on the market both directly and through the influence which the existence of these powers may have on the policies of the Mexican authorities.

From October 1942 through 1945, Treasury silver was sold to help industry. Prior to the Act of July 12, 1943, only a relatively small amount of "silver bullion ordinary" was sold, less than 5 million ounces. This was silver contained in gold shipments, recovered from mutilated coin, and from the regular melting and coining processes. It was sold at 45c. an ounce. Under the 1943 act through 1945 the Treasury sold, at 71.11c. an ounce, more than 167 million ounces. Since 1945, the Treasury has sold 1,621,000 oz. of silver, almost all of it during the past few weeks.

Free Silver and Lend-Lease

The market, with an eye on possible Treasury sales, looks first at the so-called free silver in the Treasury. This silver, the counterpart of seignorage accruing to the Treasury under the silver purchase laws, is metal not required as backing for outstanding silver certificates. At this writing the free silver is a rather substantial amount—about 153 million ounces. Such subsidiary coinage needs as may arise while the Treasury possesses free silver are met out of that silver, rather than by the Treasury's entering the markets for more metal. In World War II the demand for subsidiary coins of the smaller denominations became very great, what with so much moving about of the population and the consequent need to have cash on hand. Inflation of prices also is reflected in greater need for subsidiary coins. If we get into an all-out war with Russia, it is conceivable that all the free silver would be earmarked for the use of the mints and thus become no longer available to industry.

As compared with the 153 million ounces of free silver now in the Treasury, it is noteworthy that during World War II the minting of subsidiary coins consumed an annual average of 64 million ounces of silver. Unlike the war period, when newly-mined domestic and imported silver was channeled through various Government orders away from the Treasury and into industry, today newly-mined silver is in large part coming to the Treasury for reasons already discussed. In this way 3 million ounces monthly are coming to the Treasury. Lend-lease silver could be an additional substantial source of free silver, but this is not likely to develop in the near future.

Under the Act of March 11, 1941, as amended, nearly 411 million ounces of free silver were supplied to eight foreign governments for coinage and war uses. The various lend-lease agreements set time limits for the return of the silver ounce-for-ounce, the limits being five and in some cases seven years after the end of the then-existing emergency as determined by the President. Such determination having not yet been made, the return of the silver is not in sight. Of the 411 million ounces thus lend-leased during the war, only the 261,333 ounces lend-leased to Belgium has been replaced.

The responsibility of securing and of repaying an equivalent amount of silver rests with the countries which received the lend-lease silver. It is unofficially reported that several of the lend-lease governments have been taking steps to assemble silver to meet their obligation to the United States. Silver coins have been demonetized and in some cases base-metal coins have been substituted. In others the fineness of the silver coins has been lowered. Apart from Belgium, which has repaid, lend-lease silver obligations are as follows:

Australia	11,773,093 oz.
Ethiopia	5,425,000 oz.
Fiji Islands	196,364 oz.
Great Britain	88,073,878 oz.
India	225,999,904 oz.
Netherlands	56,737,341 oz.
Saudi Arabia	22,347,431 oz.
Total still outstanding	410,553,011 oz.

When the repayment proviso was inserted in the silver lend-lease agreements at the instance of silver senators, presumably it was believed that, as in the case of Pittman Act silver after World War I, the world silver market would benefit by the debtor governments going out and buying silver to be turned over to the United States. The actual effect has been to encourage the demonetization of silver on a wide scale, even in India, where since time immemorial silver has constituted the principal money metal. Lend-lease countries have not gone out into the market to buy silver, but have taken the metal out of circulation instead.

India reportedly has withdrawn from circulation much more than enough silver to repay its lend-lease obligation to the United States. Great Britain is believed to have similarly accumulated approximately one-fourth of its 88 million-ounce obligation. The Netherlands is believed to be holding the greater part of the lend-lease silver coins it received from us in their original form. It was found that, when the coins were paid out, they were hoarded. Therefore, issuance was stopped.

Since replacement of the lend-lease silver is not required until some time in the indefinite future, it is not expected in Washington that other countries will follow Belgium's example. The history of inter-governmental war debts is bound to inspire hope that somehow, if one just waits, it will become unnecessary to pay up.

Busbar Silver

During the war the Treasury leased silver bullion to the Defense Plant Corporation, a U.S. Government agency, and others to a total of 902,622,278 ounces. Of this, nearly 402 million ounces is still so held. The greater part of the last-mentioned silver is in use at the Atomic Energy Commission's Oak Ridge plant. On the Treasury's books about 350 million ounces of the silver at Oak Ridge is entered as reserve against outstanding silver certificates and some 51 million ounces as free silver. It would take only a bookkeeping entry, however, to classify the 51 million ounces as certificate-reserve silver and simultaneously to release an equal amount of silver now held in certificate reserve. The busbar silver therefore does not affect the position of the Treasury as a potential seller of silver.

Mexican Control of Market

With the U.S. Treasury sitting on the largest hoard of silver ever accumulated by any nation, Mex-

ico, the world's chief silver mining country, with the collaboration of Cuba in regulating its sale of demonetized Cuban pesos, has latterly been able to control the market price of foreign silver in New York.* The Mexican authorities bring about the desired price of silver not only by regulating the exportation of the metal, but also through having the Bank of Mexico buy silver from time to time. The outlines of Mexico's silver policy last year may be traced in Handy and Harman's 35th annual review of the silver market for 1950. There we read, for example, an explanation of the increase in the price of silver in New York from 73c. to 80.25c. an ounce last October.

"During October demand reached a point where daily offerings of metal from current production were seldom enough to satisfy buyers, and other sellers with available stocks were regularly filling a large portion of the market's needs. Therefore, when it was announced on Monday morning, October 23, that Mexico was no longer willing to make sales from accumulated stocks, and when it further developed that Spanish and Cuban silver was also temporarily unavailable, producers were presented with an unusually heavy demand. Offerings on that day at 73c. were wholly inadequate, and eventually buyers found it necessary to pay 78c. in order to satisfy their requirements. The next day a more moderate advance carried the market to 80.25c. per ounce."

Last November the director of the Bank of Mexico disclaimed charges that Mexico had driven the price up. Mexico, he explained, was merely seeking stability in silver. Yet this summer, when Mexico announced suspension of silver exports for the rest of 1951, the New York price, which had recently sagged to 87.75c., promptly climbed back to 90.16c., an instance of market influence, at least.

Revived Agitation for Repeal

The Silver Users Association has more than once publicly complained of Mexico's control of the silver market, citing that control as a reason the American silver purchase laws should be repealed. There is little question about Mexico's policy of "keeping the market orderly," at as high a level as possible. Obviously, Mexico does this in her own interest as the world's largest silver-mining country and thus, on net balance, a seller of silver. The question at issue is whether such stabilizing activities are in the interests of the United States as well. Here there is a division of interest between American silver users and American mining interests operating at home as well as abroad. A high world price makes this subsidy to American miners less conspicuous.

When on January 5, 1951, Mexico and others failed to offer any silver on the market and the price, as in October 1950, had to be raised, Admiral Ramsey, the legislative counsel of the Silver Users Association, in a press release stated that "it is more than ever necessary to seek the repeal of the silver purchase laws which guarantee a fixed price to the producers of silver in this country . . . This annual production is not needed by the Treasury, nor is it necessary for monetary use. It is needed by the industrial users and would go a long way toward breaking the strangle hold enjoyed by foreign governments and producers on the silver market."

In an earlier press release the Admiral quoted, from a Nevada newspaper, a statement made by the general manager of the Sunshine Mining Co. which suggests that the U.S. mining industry is not disturbed by Mexico's silver activities. That statement reads: "Mexico, the number one silver producer, is doing a very good job in stabilizing the market for its product. A variable part of the country's production goes to domestic coinage, more when the market is weak, less when it is strong. The Mexican Government maintains an office in New York which buys up excess silver and sells when the demand is heavy."

Conclusion

So long as the vast U.S. silver stock continues to be held chiefly as security for outstanding paper money, while the mints supply an assured market for newly-mined domestic silver at a favorable price, Mexico, as the largest silver producer and as a large user of silver coins at home, will continue to be in a position to stabilize and regulate the world market for the silver which industry draws upon for its raw material.

The domestic industrial market may be eased by a change in the OPS ceiling on domestic newly-mined silver, as fabricators point out. During World War II steps were taken by the production and price control authorities to ease the supply problem of silver users.

But there is no sign of any effort, not even a feeble effort, to strike the silver purchase laws from the books; much less, to reduce the supply of silver held by the Treasury as certificate reserve.

* Mexican-Cuban collaboration was reported in the July 1950 issue of the ENGINEERING AND MINING JOURNAL.

Higher Water Level Means More Iron Ore

THIS YEAR'S water levels in the Great Lakes have been contributing to the exceptionally heavy movement of iron ore from the Lake Superior areas to the ports down the lakes. These shipments have been at the highest point reached in several years.

Inasmuch as iron ore carriers of conventional size on the Lakes can transport about 100 tons of ore for each added inch of water, the water level of the Great Lakes is of prime importance to bulk shippers using that waterway. Lake Superior's water level has recently been 1.5 ft. higher than the low-water datum; Lake Huron and Lake Michigan have been 2.4 ft. above, Lake Erie has been 3.4 ft. higher and Lake Ontario 4.8 ft. higher than the low-water datum.

Recommended drafts for bulk carriers, upbound, is 22 ft. for the Detroit River and 20 ft. 11 in. for the St. Mary's. This compares with 21 ft. 3 in. for the Detroit River last year and 19 ft. 5 in. for the St. Mary's.

Downbound, the recommended draft for the Detroit River is 26 ft. as compared to 24 ft. 9 in. in August last year, and for the St. Mary's River a present 24 ft. 9 in. as compared to 23 ft. 3 in. a year ago.

Upon only one point do the water experts agree in any discussion on this change in the water level—that this increase in water could possibly add as much as a full cargo of ore over the season, per ship, pleasant news to an industry already short of raw material.

TWO 190-HP. ENGINES, each equipped with integrally built torque converter, power this 34-ton truck, here seen coming out of M. A. Hanna's Douglas pit near Chisholm. Converters can multiply torque a maximum of 3.6 to 1.

What the Torque Converter Can Do For Open-Pit Truck Haulage

"The converter now dominates the off-highway field and there is nothing on the horizon to replace it."

H. E. FARNAM, JR.
Supervisor of Mobile Equipment
M. A. Hanna Co., Hibbing, Minn.

NEED FOR SOME SYSTEM of connecting the engine of the off-highway truck to the load without shock has been recognized for years in the Lake Superior Iron Country. As the off-highway trucks became larger and the loads heavier, the need for some shock reducer became more pressing. In the summer of 1948, torque converters were first intro-

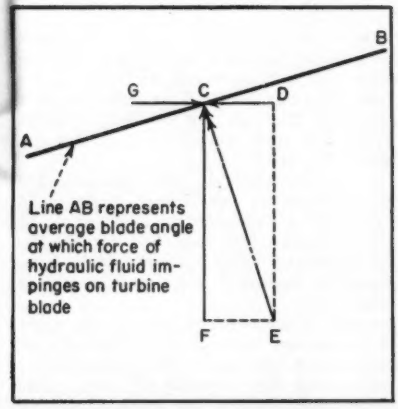


FIG. 1. TORQUE CONVERTER multiplies torque. Vector force CF, representing torque at output shaft, is three times original force GC of fluid impinging on turbine blade.

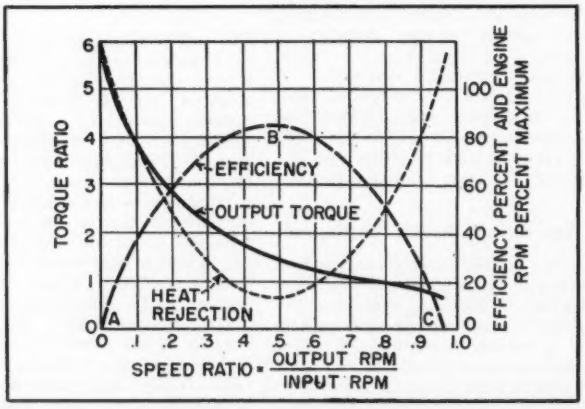


FIG. 2. GENERAL EFFICIENCY CURVE for torque converter (above). Point of maximum efficiency, at B, is between 80 and 85%. Engine torque is multiplied by 1½.

duced for this purpose on the Minnesota ranges.

The torque converter solves many problems:

1. It reduces or eliminates shock loading of the driving train caused by shifting.
2. It acts as a transmission with an infinite number of gear splits in its torque-multiplication range.
3. Engine lugging is completely eliminated, except during stall conditions with a three-stage converter.
4. The converter acts as a cushioner to the driving train when shock loads are introduced by rough roads.

What Causes Shock Loads?

Shock loads are introduced into the driving train by engagement of the clutch when the crankshaft speed is not approximately the transmission clutch shaft speed. Driving a mine truck on the Mesabi is a repetitious job. The driver makes 20 to 30 trips over the same route every 8-hr. working period. During an average trip, he engages the clutch about 8 times. This means that he shifts gears from 160 to 280 times per working period. From this, it can be seen that an occasional miscalculation on the driver's part places a high strain on the driving mechanism. Shock loads, which can be as high as 10 times the engine torque, are fatal to driving-train parts. Some type of shock absorption device was needed to overcome these equipment-breaking shock loads.

Most of the mine haulage trucks on the Range use diesel engines as power plants. To get the most out of these engines, the r.p.m. must be kept at or near the governed rated speed. When the r.p.m. drops and the engine is lugged, the unit pressure inside the engine becomes excessive. Pistons, rings, connecting rods, crankshaft, and bearing life suffer.

Lugging is due to the following: When a truck is travelling up-grade, the horsepower demand of the vehicle is passed back to the engine through the driving train. This demand is controlled by: 1, load; 2, rolling resistance; 3, grade percent; and 4, vehicle speed. The driver of a standard truck tries to pick a gear in his transmission that will match the horsepower of the engine to the horsepower demand of the moving truck. If he has a gear that matches well, the truck will go up-grade with the engine running at or near rated horsepower and rated r.p.m. If one or more of the four horsepower-demand factors change, however, either the engine r.p.m. will increase to where the governor begins to take over or the engine speed will drop until the engine is running in a lugging condition. When the engine is running against the governor, there is no ill effect, but the driver is not getting full use of the rated horsepower. If the driver allows the engine to lug seriously and does not shift gears, the engine will stall. When haulage trucks are working on varying grades, it is a continual problem for the driver to match engine horsepower and characteristics against horsepower demands of the vehicle. This, of course, is where the problem of shifting and shock loads becomes most serious.

One point in particular should be brought out with regard to lugging: As the engine speed drops from rated r.p.m. with a full throttle, the torque of the engine increases to a maximum at 75 to 80% of rated r.p.m. Once the engine has lugged below its maximum torque point, the power fall-off is rapid. Torque converters were introduced to eliminate the need for shifting. This, in turn, would eliminate the shock loads and lugging.

How the Torque Converter Multiplies Torque

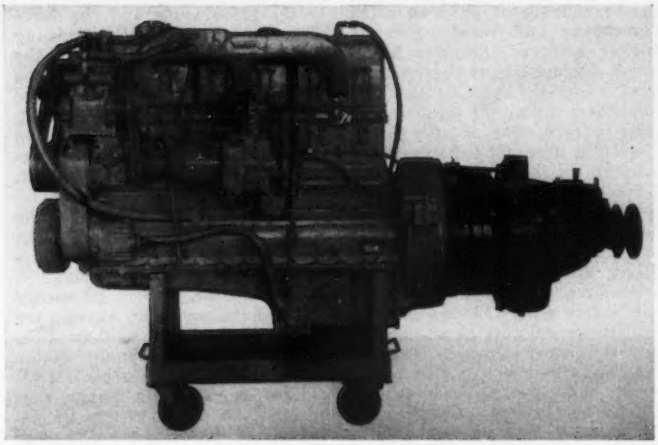
The principal parts of a torque converter are:

1. The pump which is driven by the engine.
2. The turbine, which absorbs the energy given off by the pump and is connected to the output shaft.
3. The reaction members.

When the driver opens the engine throttle, the pump begins to pump hydraulic fluid. As this fluid leaves the end of the pump blades, it has considerable velocity energy. The fluid from the pump is thrown against the turbine blades. Part of its velocity energy is changed into force as the angular acceleration of the fluid is changed by the curvature of the turbine blades. If, in Fig. 1, the line AB represents the mean or average blade angle at which the force of the fluid GC impinges upon the blade, a vector diagram can be drawn showing how this force is multiplied to give a higher rotating force than the original fluid force. The vector CD represents the equal and opposite force. If this counterforce CD is projected perpendicularly, line CE, to the blade angle and the force diagram completed by drawing line CF, which is parallel to the plane of rotation of the turbine blade, there is now a vector force CF which is three times as long as the original force GC. The force CF is applied to turbine and represents torque at the output shaft. The reaction member is used to redirect the fluid after it leaves the ends of the turbine blades back into the pump with as little loss of remaining velocity energy as possible. In this manner, the velocity energy of the fluid impinging against the turbine blades can be built up. This, in turn, helps multply the engine torque. Fig. 2 shows a general efficiency curve for a torque converter. Point A shows that the efficiency of the converter is zero at stall. Stall is a condition where the output shaft is not rotating: torque multiplication is at its maximum. All the horsepower of the engine is being rejected as heat. B denotes the point of maximum efficiency between 80 and 85%; engine horsepower rejection in the form of heat is at a minimum. Engine torque is being multiplied about 1½ times. Point C locates racing on the efficiency curve. Here the output shaft speed is approaching input shaft speed. Converter efficiency is zero, and all the engine's horsepower is being rejected in the form of heat. Torque multiplication is at a minimum.

First Installation on Mesabi

The first torque converter installed on the Mesabi range was a 3-stage converter. A photograph, page 70, shows it connected directly to the flywheel housing of a six-cylinder supercharged diesel engine rated at 275 hp. The converter had a multiplying capacity of 6 to 1. The mechanical section of the converter contained a reversing gear and lock-out mechanism so that the hydraulic section could be disconnected from the engine and the power from the crankshaft could be transmitted directly to the driving train. Behind the converter was a gear box. This gear box contained enough gearing to give the driver an underdrive gear for extremely hard pulling, a direct drive gear for normal hauling, and an overdrive gear for highspeed hauling or empty return to the pit. The power take-off for the hoist pump was located on the back gear box. This meant the driver had to disengage the gear box everytime he dumped his load. Later models



THREE-STAGE CONVERTER, at right, has multiplying capacity of 6 to 1. It is connected directly to flywheel housing of 6-cylinder supercharged diesel.

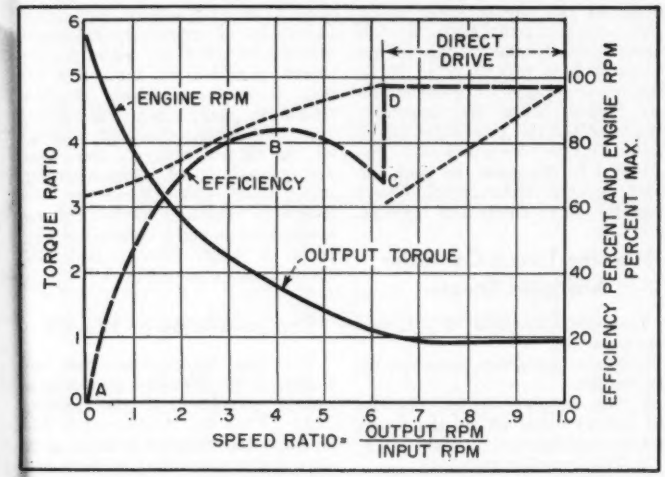


FIG. 3. EFFICIENCY CURVE for 3-stage converter shown in photo above.

changed this mounting to the converter itself, thus simplifying load-dumping.

Fig. 3 shows the efficiency curve for this converter. Point A represents efficiency at stall; Point B, maximum efficiency at 89%; Point C, shift point at about .6 speed ratio; at D the converter is locked out at 100% efficiency, less seal and bearing losses. When the converter is at stall, the torque is 6 times the engine torque and the engine speed is down to a minimum. As the output shaft begins to rotate, torque multiplication drops rapidly and engine speed increases to maximum at D. When the converter is locked out, engine becomes the same as the output shaft speed is at C. From there on, engine speed and output shaft speed are identical.

Engine Power Matches Demand

To drive a truck with this converter, the driver selects the proper traveling gear in the auxiliary box. To connect the engine to the converter unit, he operates the clutch by means of an electrical foot button and moves the directional shift lever to "forward" position. From this point on, he controls the vehicle with his foot throttle, with which he may either connect or disconnect the converter and driving train. The converter automatically matches the engine power to the vehicle demand. If the vehicle speed passes the point of maximum efficiency for the converter, a red dashlight appears to warn the driver. He may then lift his foot momentarily off the throttle, automatically shifting the converter into "direct." This locks out the hydraulic section and the crankshaft of the engine is connected directly to the driving train. If road conditions change, for example grade increasing, and the engine, which has been connected directly to the driving train, begins to lug down, the driver momentarily lifts his foot off the throttle and engine again drives the truck through the hydraulic section of the converter. Thus, the advantages of the infinite ratios in the converter and the mechanical efficiency of the gear box drive can be utilized by locking the converter in or out.

More Installations

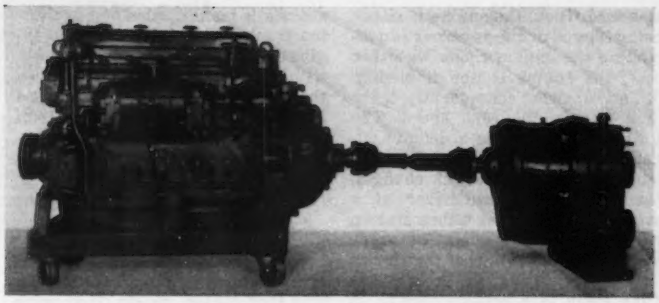
The second converter was installed in a 20-ton truck that had been converted into a tractor for a 25-cu. yd. semi-trailer. This converter was also a three-stage unit. It did not have a clutch, which created some problems. The unit had a directional reversing box directly behind the converter and a two-speed manually-controlled planetary gear box bolted directly to the reversing section. There was no provision for locking out the hydraulic section of the converter. This meant that on a level or downhill haul when the engine had more power than the vehicle demanded, the converter would operate in racing. The efficiency curve for this converter is similar to the general converter curve, Fig. 2. In racing, the converter absorbs the engine horsepower and rejects it as heat instead of usable power to the driving train; thus, the driver, if he kept the throttle wide open, could use as much horsepower going down grade as he could ascending.

The next installation to be tried was a 30-ton tandem axle unit. Fig. 4 illustrates a single-stage converter connected to a six-cylinder, two-cycle engine rated at 190 hp. A short driveline connects the output shaft of the converter to a three-speed semi-automatic planetary transmission. The converter had a multiplication capacity of about 3.6 to 1. Two engines were used in this truck to handle the 30-long ton load. Each engine had its own converter, three-speed planetary semi-automatic transmission, driveline, and rear axle. This single-stage conver-

ter has two stators operating on overrunning clutches. When the converter output shaft speed approached the clutch point, the first stator would release or freewheel, thus changing the characteristics of the converter by broadening the peak of the efficiency curve. Again, as the output shaft speed approached the clutch point of this temporarily revised converter, the second stator would break loose or freewheel. With both stators freewheeling, the converter would operate as a fluid coupling. In this way, advantage was taken of the single-stage converter's simplicity, and yet, above the clutch points, the efficiency of the coupling could be used. Fig. 4 shows the efficiency curve for this converter. Point A represents efficiency at stall. Point B, the first stator breaks loose. Point C, the second stator breaks loose. Point D, the converter, is operating as a fluid coupling. At stall (Point A) the engine does not lug down. As the output shaft speed increases, engine speed decreases until the efficiency curve nears its peak; from then on, engine speed increases slightly. With this unit, the engine is connected directly to the converter. To shift the planetary transmission, all that has to be done by the driver is to place the selector valve in the notch for the proper gear. Hydraulic pressure on the planetary clutches does the rest.

A Fourth Type of Installation

The fourth type of converter installation was a single-stage unit with a multiplication capacity of about 3 to 1. This converter differs from the other single-stage converter in that the stators or reaction members do not freewheel. The converter does not operate as a fluid coupling at high output speeds. The efficiency curve for this converter is similar to the general converter curve, Fig. 2. Like a previous installation, the engine is connected directly to the converter, but the output shaft is connected to the transmission through a two-plate clutch. Since this clutch must at times sustain a torque three times engine torque, any possibility of clutch slippage must be eliminated. Therefore, the clutch button is placed so that it can be conveniently operated only by the driver's right foot. If the driver has to change gears during the haul, he must remove his foot from the throttle to actuate the pneumatic valve that controls the clutch. Thus, the clutch cannot be operated when the engine is running at open throttle. Transmissions used in conjunction with the converter are either 4-, 5-, or 8-speed gear boxes.



SINGLE-STAGE CONVERTER connected directly to six-cylinder, two-cycle engine rated at 190 hp. Multiplication capacity was approximately 3.6 to 1.

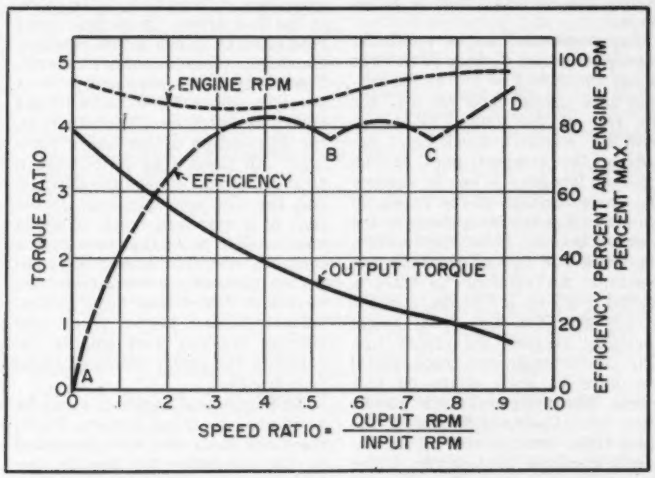


FIG. 4. EFFICIENCY CURVE for single-stage converter shown at top.

Recent Design Change

The latest change in design in the three-stage converter incorporates a dry-plate clutch between the flywheel and the converter input shaft. With the clutch located in this position, there is little danger that engine torque will cause slippage. A five-speed close-spaced ratio gear transmission is used behind this converter. Here, the driver selects the proper running gear and controls the vehicle speed with the foot throttle. If he chooses to change gears, he does so just as he would do in a standard truck. Another feature of this new design allows the driver to use the converter as a brake. By bucking the hydraulic characteristics of the pump and turbine against each other, the converter can absorb about as much horsepower as the engine will produce. Although the converter braking action is not as severe as the air brakes, the vehicle can be kept at a reasonable speed on downgrades by the converter braking action alone.

Performance Good

The performance of a converter-driven truck has been good. These trucks leave the shovel easily and smoothly. Acceleration is rapid. On grades the converter-driven truck can out-perform the standard truck unless the grade, load and road conditions have been tailor-made for the standard truck. Under load when the driver has the engine throttle wide open, the converter will absorb all the horsepower the engine will develop. This horsepower, of course, is translated into speed at the wheels. If the road conditions are not ideal for the

standard truck, the engine is either being lugged or the governor is controlling the engine r.p.m. In either case, the engine is not developing full horsepower; consequently, there is a loss in the road speed. The torque converter has a definite advantage on roads that are rolling and have many gradient changes. On such roads, the driver of a standard truck must either stay in one gear all the way up the grade and lose the advantage of the truck's horsepower rating, or shift everytime there is a serious change in the grade. These numerous shifts are fatiguing for the driver and expose the driving train to shock loads.

The grade condition on which the converter shows to best advantage is one which is 8 or 9% at the bottom and drops to 5 or 6% for the rest of the haul. The driver with the standard truck must negotiate the steepest part of the grade in low gear. When he reaches the less steep part of the grade, he cannot utilize the other gears in the gear box because, if he tries to shift, the truck will lose all forward momentum. An attempt to start a loaded truck on a 5% grade in the proper gear for that grade would seriously shorten the clutch life. The converter-driven truck would not have to shift gears on this grade. The converter would handle these variations easily and at the same time would absorb all the engine's available horsepower. Given the advantage of a well-engineered haul road, the standard truck can out-perform the converter by about 10% on the haul part of the cycle. However, on the average road the converter can out-perform the standard truck by 10 to 15%.

Takes More Fuel

Fuel consumption in general has been higher on the converter-driven trucks. The converter's maximum efficiency is between 80 and 85%. In a few scattered instances where the road conditions have been advantageous for the converter, they have actually used less fuel per trip than the standard truck. Over extended periods, it has been found that the three-stage converters use about 7% more fuel and the single-stage converter about 10% more fuel than the standard truck. The 30-ton twin-engined units have shown fuel savings of about 6% per yard of material handled over the 20-ton standard truck. Fuel checks were run on 30-ton trucks using twin engines, converters, and semi-automatic transmission versus a 30-ton truck with a 400-hp. single engine and a standard transmission without converter. The test showed that the standard 30-ton unit used about 10% less fuel per hour than the converter-driven truck and outperformed it on the grade.

Less Truck Maintenance With Less Shock Loading

Does the torque converter cut truck maintenance cost? In the four standard 20-ton trucks that were changed over to converter drive, there have been no failures of the drivelines, differentials, drive axles, or the final drives. These four units have close to 10,000 actual working hours on these component parts. The life of these component parts is normally about 5,000 hours. What makes the difference? The answer is, the elimination of the shock loadings. All these four units have a total reduction between the flywheel and the tire approximately double that of a standard truck. This is mentioned to prove that pure engine torque is not what breaks the component parts of a driving train. We have also found that head gasket, valve breakage, piston, rings, and bearing troubles were greatly reduced in the power plants of these four trucks.

This increased engine life may be attributed to three factors. First, the shock loads that are eliminated by the converter for the driving train are also eliminated for the engine. Undoubtedly, shock loads when transmitted by a dry-plate clutch back to the flywheel do set up some torsional vibrations in the crankshaft that are transmitted throughout the engine. Second, as mentioned earlier, the converter eliminates almost all engine lugging. This non-lugging may be the reason why the life of the head gasket, piston, ring, and bearing has increased. Third, with the converter in the driving train, engine overspeeding on down-hill runs is practically eliminated. The engine in a standard truck is subjected to occasional overspeeding on these runs, and it has been proven many times that valve life is materially shortened when the engine is overspeeded.

The maintenance cost of the converter has been about 9¢ per operating hour. The manufacturers are still making modifications in the converters, particularly the mechanical parts, to reduce maintenance cost and to fit the needs of the mining companies. The major difficulties in the single-stage converter have been seal and bearing failures. Seal troubles have been an expensive item for the operator. Under adverse conditions, converter make-up oil costs about 30 cents per operating hour. The average overall make-up cost is about 10 cents per hour. Fortunately, a converter can be removed and repaired one re-installed in the trunk by two men in about six hours. The overhaul time for an average converter repair is about 12 man-hours. Converter repair is not complicated, but care and proper technique must be used to have an acceptable repair job.

Truck available for the mine operator is an important consideration. With the increased use of expensive 30-ton trucks, down time must be reduced to a minimum. The converter has definitely contributed much to the present high availability of these larger trucks. The 30-ton converter-driven trucks are available for service 20 to 25% more than their smaller standard counterparts.

What Transmission?

An important question today is: What transmission is most suitable for use in conjunction with a torque converter? The standard four- or five-speed gear box has the advantage of reasonable initial cost and low overhaul cost. Here the gear ratios can be changed to fit a particular operation and there are optional ratios available. The three-speed semi-automatic transmission is by far the easiest for the driver to handle; it can be shifted under a full torque load without gear or clutch damage. The semi-automatic has been used only in conjunction with the single-stage converter. To date, all the three-stage converters have been used with manually-operated gear boxes. Perhaps in the future, the advantages of the three-stage converter and the semi-automatic transmission may be utilized in the same truck. With these two in the same truck, maximum range and efficiency can be attained, and driver fatigue from transmission multiplication reduced to a bare minimum.

The present trend on the Mesabi range is definitely toward converters. The majority of the trucks delivered to the mining companies this year have been converter-driven. Regardless of mechanical imperfections and high operating costs, the converter now dominates the off-highway field and there is nothing on the horizon to replace it.

KEEPING TAB ON PRACTICE

Twisted Return Runs for Conveyor Belts. Two conveyor belts using twisted return runs have been installed by a mining company in the Lake Superior Iron Country. The purpose in twisting is to put the clean side of the belt against the return idlers. One of the belts, which has been given a 180-deg. twist, is a stockpile belt which operates in a gallery at one of the shafts. This has already been put in operation but some time will be required to determine the results. The other belt is installed underground.

The 9-in. Churn-Drill Hole. Frequent use in the Iron Country of the 42-T Bucyrus-Erie churn drill, designed primarily to drill 12-in. holes, for putting down the popular 9-in. hole, has a simple explanation. The greater weight of the 42-T's drill bit and stem, compared with that of the tools used with the 29-T drill (designed for 9-in. holes) gives faster penetration per hour of drill operation. Further, the 9-in. hole has proved adequate.

Oversize Dipper? Why use a 6-yd. dipper on a 5-yd. shovel? An open-pit operator in the Southwest who follows this practice explains his preference as follows: A recording ammeter on the shovel showed that more power was used in the efforts to fill the 5-yd. dipper full than was required in filling the 6-yd. dipper substituted nearly full. To fill the last quarter-yard of the 5-yd. dipper took considerable crowding.

"P.M." Handbook. G. H. Cave, Rip Bits, Ltd., Sheffield, England, sends a copy of a new 4x6-in. 33-pp. instruction book covering P.M. single-use bits. Compiled primarily to assist large users of these bits, particularly in countries outside Great Britain, the book indicates that this throwaway bit is going strong. Total annual output of the South African, Canadian and British factories that make it exceeds the 57-million mark.

Selecting Excavators for Stripping. When it is necessary to make box-cuts in deep overburden, the large walking dragline is much superior to the big stripping shovel which, as now constructed, is ordinarily capable of box-cutting in a maximum of only about 35 ft. of overburden. The big walking drag, on the other hand, ordinarily encounters no difficulty in box-cutting in up to 60 ft. of overburden. This makes the opening-up of the property being stripped much simpler in many cases, since the initial box cut need not be confined to areas of the shallowest overburden.

The nature of a deposit to be stripped has considerable influence upon the selection of a stripping unit, insofar as a real distribution of the material is concerned. If the occurrences are patchy, it would be necessary to work each patch for a relatively short period of time and, when it is worked out, to move to another patch, initiate a new box cut, and start the sequence of pits all over again. With a large stripping shovel this is frequently rather tedious, costly and difficult. When the deposit is worked out, it becomes necessary for the shovel working on the upper surface of the deposit to dig itself out of the pit, move across the ground surface and dig down into another pit. In contrast, the walking dragline simply moves on the ground surface from one pit to another.

A layer of hard rock well up in the bank, above the shovel shipper shaft, can offer serious difficulty to excavation by shovel. At elevations above the shipper shaft it becomes necessary to crowd and hoist with full power at the same time. The crowding and hoisting actions oppose each other, with resulting decrease in digging efficiency and great interest in shovel maintenance costs. The dragline, on the other hand, is not particularly affected by such location of layers of hard digging, except at considerable depth below its base, when the horizontal component of the drag pull becomes considerably lessened, and it is increasingly difficult to drag the bucket through the hard material.

Varying Hardness of Ore Slows Carbide Drilling. Extensive tests with tungsten-carbide-tipped bits in drilling ore, jasper and greenstone have been made by a Lake Superior mining operator in underground mines on the Minnesota ranges, using various types of drills. Up to the present time no combination has been found that will stand up in the ore. Penetration has been fair and in some cases bit life satisfactory in softer seams of ore. Hardness of the ore has varied in a short distance so much that it has been impossible to pick spots where the tipped bits could be used satisfactorily. In most cases they shattered within a few inches to a few feet. In one case six bits were shattered in 10 in. of hole in a bit manufacturer's test.

The greenstone is comparatively soft. Such good drilling results have been secured with standard steel detachable bits that it is impractical to use carbide-tipped bits in it. Tight-fitting threads on drill rods have proved to be a big factor in prolonging thread life.

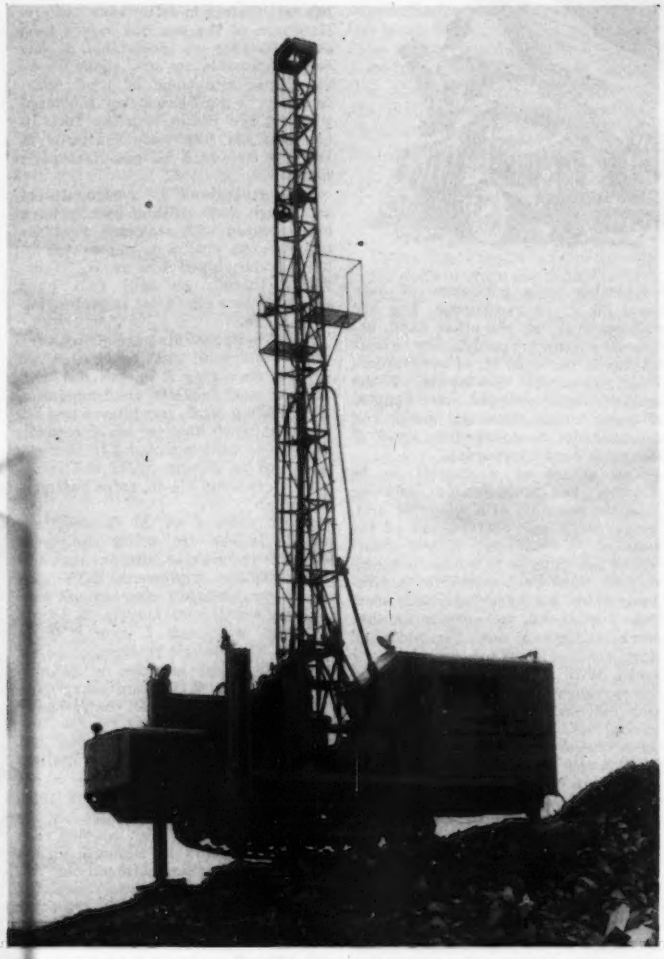
Carbide-tipped bits have shown very good results in drilling jasper. In ground averaging 3 in. per use with regular steel Jackbits, the company is now drilling 30 ft. per bit-use and six times as much hole per machine-shift. Jumbo- or post-mounted 3-in. drifters are used in driving drifts and cross-cuts. In raising, 3⅛-in. stope hammers are used.

Blast holes 6 to 20 ft. deep are drilled in the ore, using equipment similar to regular exploration diamond-drilling equipment. EXT diamond impregnated coring bits are used on single-wall core barrels, 2, 4 or 6 ft. long, with rods 2, 4 or 6 ft. in length. The electric or compressed-air driven drills are mounted on movable arms of 4-in. O.D. extra-heavy pipe attached to 4-in. O.D. extra-heavy double-jacked columns.

Long Holes in Sublevel Incline Cut-and-Fill Stoping. For three months in the second half of 1950, East Malartic Mines, in Quebec, in drilling long holes with coupled rods and carbide bits in sublevel incline cut-and-fill stoping, obtained the following footages for bits, couplings and adapters: Carbide bits, 232.4 ft.; couplings, 134.2 ft.; bit adapters, 278 ft.; and lugged chuck adapters lasted for 140.4 ft.

Most of the drilling consisted of up-holes, 50-55 deg. from horizontal. In drilling the rest, which were down-holes at the same angle below the horizontal, performance was not so good and efforts have been made to improve it. Holes averaged 40 ft. in length, with a maximum of 50. The formations include syenite porphyry, diorite and green stone. Slips, fractured zones and soft ground have presented more difficulties than have been encountered in solid rock.

Equipment used comprised the following: Drill—268-lb. Gardner-Denver CF-99 wet construction drifter, with 4-in. piston and oversize water tube. Rod—1⅛-in. diameter Chippewa hollow-round alloy steel, with standard Timken thread, made up and threaded in shop. Bits—2-in. Timken 4-wing carbide screw bit. Couplings—Standard Timken 1¼-in. outside diameter by 3 in. long for 1⅛-in. thread. For collaring, a 2⅛-in. Craig steel bit and special adapter.



THE NEW ROTARY DRILL at work in an open-cut iron ore mine in a Western state. The derrick is of special height for handling long lengths of drill pipe.

Rotary Air-Blast Drilling Now Ready for Pit Jobs

Faster penetration, better efficiency and longer bit life are claimed for new machine

AFTER YEAR-LONG FIELD TESTS in limestone and dolomite quarries and in strip coal mines, the rotary air-blast drill developed by Joy Mfg. Co. was introduced to open-cut metal and non-metallic mines last fall. Results of tests with 6¼-in. holes in various parts of the United States and Canada, although not yet complete, indicate that the drill, known as the Champion, is adaptable to most open-cut metal and non-metallic mine blast hole drilling conditions.

How the Drill Works

The principle upon which the drill works is said by the manufacturer to be an innovation in blast-hole drilling. While rotary drilling with a roller-cone type bit has been used in oil field work for years, the method used for removing cuttings is new. A continuous blast of compressed air, from a compressor on the machine, removes all cuttings from the face of the bit as quickly as they are made. The blast also forces the cuttings up the hole, outside the drill pipe, to the surface, where they are collected by a rotary dust collector.

Because of this instantaneous removal of all cuttings, it is claimed, the bit, under continuous pressure, bites into virgin rock at all times. No cuttings remain at the bottom of the hole to be reground. Faster penetration and greater bit efficiency for longer bit life are claimed. No water is used, eliminating the expense of laying lines or hauling water over long distances. This is an advantage especially for work in cold climates.

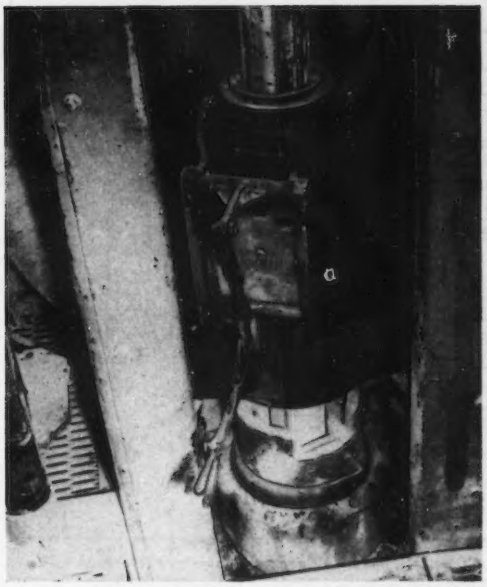
The rotary drilling principle, while old as drilling methods go, is relatively new in large diameter blast-hole work. The bit is forced continuously against the bottom by hydraulic pressure, and the rigid stem drills straight, smooth-walled holes. This facilitates the distribution of power in loading.

Toothed Bit

These bits are designed with three bearing-mounted cones on which teeth are arranged in definite patterns. The patterns differ on bits to be used for differing hardnesses. Compressed air is introduced through the drill pipe, and, at the bit, is directed to the periphery of the hole for removal of the cuttings. The air flowing over the bit also serves to keep it cool while drilling.

An hydraulic feed is used, the speed being regulated by controllable pressure. The pipe is rechucked automatically by a single control lever at the end of each 4-ft. advance.

The machine is crawler-mounted and self-propelled. Different models tram at speeds ranging from 1 to 7 m.p.h. Three hydraulic jacks, each with a 49-in. stroke, level the machine when in drilling position. An integral derrick, raised and lowered hydraulically, speeds set-up and dismantling. The standard derrick will handle 20-ft. lengths of pipe.



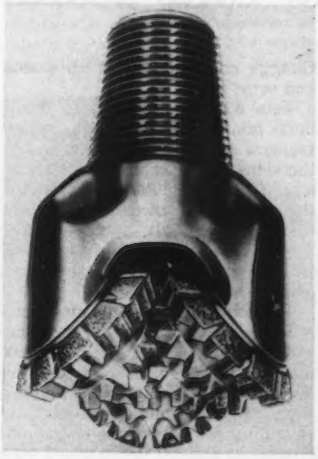
AUTOMATIC CHUCK is at bottom of feed travel (left). From this point it moves automatically to top of 4-ft. stroke. A single motion of hand lever sets chuck jaws and drilling continues immediately (right).

For 30-ft. lengths there is a special 40-ft. derrick. The weight of the heavy drill ranges from 46,000 to 50,000 lb., depending on the drive.

Some Field Results

Some experience has been had with one of these drills in drilling magnesite. Compared with average limestone and dolomite, the formation is much harder to penetrate, being fine-grained and blocky and carrying 3-5% silica and 2-3% iron, both disseminated. One-inch to 3-in. seams of chert are frequently cut which raise havoc with the drill bits.

Up to late in June the mining company had been obtaining a bit life of 375-450 ft. in hard formation, although it states that the bit manufacturer in two sets of tests in identical rock was getting a life of 650 ft. The mining company was using a bit designed for hard rock. Including moving time, 100 ft. of 6-in. hole was being averaged per shift, about the same as the footage obtained with one of the wagon drills. (Holes made by the latter are collared at 3 in. and bottomed at 2¼ in., hardfaced detachable bits being used.) A big advantage is indicated in that the holes drilled by the rotary machine were spaced 15x15 ft. against 6x6 ft. for those made by the wagon drill. Churn drills working on the same rock have given 3 ft. of 6-in. holes per hour.



ROLLER CONE BIT, one of the three types of bit used with new rotary air-blast drill. This bit is designed for hard, dense rock. Two other models serve for softer rock.

The mining company, by its blasting practice, has further bettered the results obtained. This involves use of Primacord and Dupont MS connectors. Fragmentation has been satisfactory, the secondary blasting averaging about 5%.

The rotary drill also has given satisfaction in stripping at this property, often penetrating through shale and dolomite bands to 45 ft. depth and averaging up to 300 ft. of hole per shift.

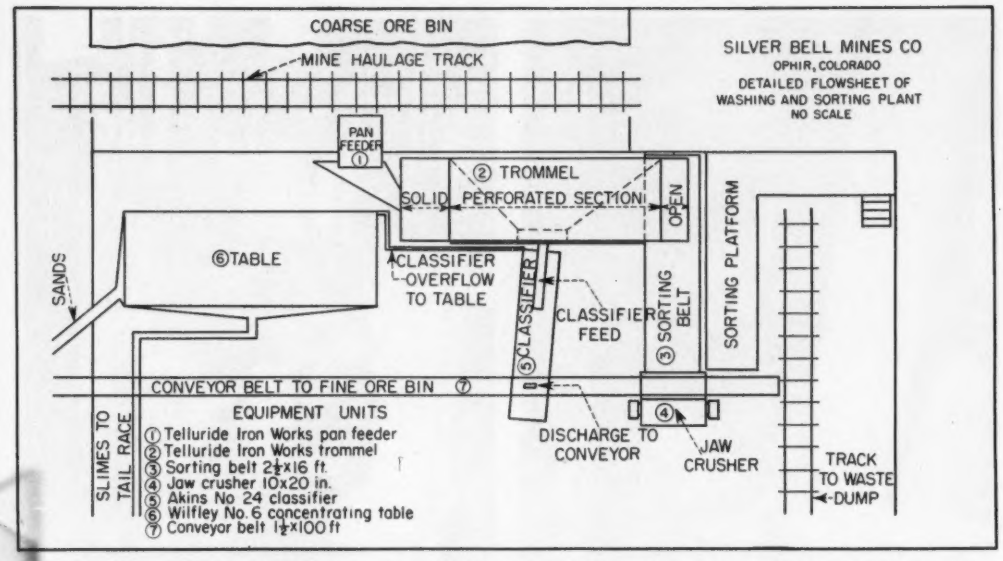
Diesel Drive Used

Elsewhere, to reach gypsum deposits, one of these drills, diesel-driven, is working principally in overburden consisting of hard dolomitic limestone with chert inclusions. It drills 20- to 40-ft. holes, averaging 20 f.p.h. Bit life varies from 600 to 1700 ft., depending on the number of chert nodules met. The same drill is also used for exploration and for testing values of deeper gypsum beds to be mined later. The machines formerly used were of the churn and wagon types, no footages for which are available.

A Michigan company has been using two of these drills in high-calcium limestone. It is obtaining 20 ft. of hole per hour and an average bit life of 1,600 ft.

One electric-driven rotary drill is used in Utah for drilling sandstone overburden above iron ore. Ten to 14 wagon drills were replaced by this unit when the contractor decided to use large-diameter holes.

A Successful Small Mine Operation



COARSE ORE is washed and screened in trommel. Plus ¾-in. passes over sorting belt where barren diorite is removed. Minus ¾-in. goes to classifier. Overflow goes to table, and sands are piped to ball-mill classifier.

Sorting Plant Cuts Milling Cost 15%

A. A. SMITH, General Superintendent, and DON N. FERGUSON, Resident Engineer, Silver Bell Mines Co., Ophir, Colorado

IN MAY, 1950, Silver Bell Mines Co., Ophir, Colo., completed a new sorting and washing plant to eliminate waste from the mill feed with the result that to date milling costs have been reduced about 15%. The following article describes the nature of the ore, mining conditions under which it is produced, and details and advantages of the new plant.

Orebodies at the Silver Bell property consist of two mineralized fissure veins in a diorite stock. Shrinkage stoping is used throughout the mine. Stope blocks vary in length from 70 to 250 ft. and are based on channel samples cut on drift levels. Stopes are carried up between 100-ft. levels; sills varying from 10 to 20 ft., depending on the ground, are left for support of upper drifts. Average stope width is 4½ ft.

Ore minerals consist of galena, tetrahedrite and pyrargyrite. Associated minerals are pyrite, hematite, magnetite, and wolframite. Gangue consists chiefly of quartz and some calcite.

Vein widths average 2 ft. Minimum mining width is 3 ft., which requires some overbreak. On one of the veins, this overbreak consists of a hard, black, and dense diorite. On the other vein uncontrollable factors such as fault gouge on both foot and hanging walls and rock alteration increase the overbreak in most cases to 2½ ft.

The hard diorite from one vein caused excessive wear on crushing and grinding equipment, whereas the material from the vein containing soft clay-like, water-saturated gouge caused gumming and sticking of milling equipment. Consequently a sorting and washing plant was installed.

An outstanding design feature of the sorting plant is the central location of the control panel which is within easy reach of the chief operator. From his position on the sorting platform, the operator can observe the entire plant, and can stop any piece of equipment immediately if necessary.

Material from the coarse-ore bin is fed into the trommel of the washing plant by a pan feeder where the feed is washed with a spray. The perforated section allows all minus-¾-in. material to fall into a hopper from which it is fed to the classifier. Sands from the classifier are discharged directly onto the conveyor through a hole cut into the bottom of the classifier and over the center of the belt. Overflow from the classifier is fed to a Wilfley concentrating table for desliming. Sands are piped to the ball-mill classifier in the adjacent mill building, and slimes go to the tail race.

Plus ¾-in. material is discharged onto the sorting belt. Two men pick out the waste and discard it into cars that are hand-trammed to the waste-dump. From the sorting belt the cleaned ore is fed to the crusher where it is crushed to 1 in. Crushed ore is conveyed by belt to the mill where it is ground and treated by standard flotation methods.

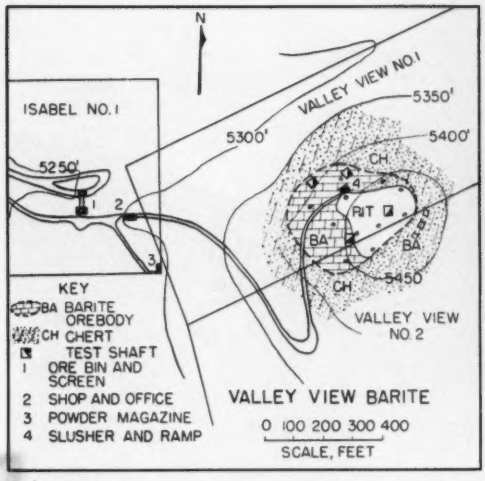
Advantages. Approximately 20% of the material trammed to the plant is discarded as waste before crushing. Milling costs have been reduced by about 15%. No additional labor is required for plant operation. Before installation of the plant, crushing was done on three shifts of one man each. Now three men working on a single shift are able to sort and crush enough ore to run the mill for three shifts.

OUTSTANDING FEATURE OF PLANT is centralized electrical controls within easy reach of workmen who can stop any equipment if necessary. Workers above are sorting out barren diorite. The process requires little effort.

THIS BIG PILE OF DIORITE was sorted out after a few weeks operation of the plant. Workers in rear are dumping carload of discarded rock which otherwise would have gone through the crushing plant and mill.

MEN RESPONSIBLE for rejuvenated and efficient operations at Silver Bell include Clifford Wilfley, consulting engineer (left); E. H. Sanders, president and general manager (center); and A. A. Smith, general superintendent.

MINING AND MILLING OPERATIONS at the Silver Bell mine, Ophir, Colo., have been greatly improved during the past few years. Note the new sorting plant and waste dump at extreme lower right.



BARITE ORE is scraped downhill to the slusher ramp in the Valley View open-pit operations at right.

TRIPLE-DRUM tugger hoist with twin tail ropes permits free lateral motion of 42-in. scraper in open pit.

Scraper Assembly Cuts Costs at Open-

H. J. TILLIA, Mine Superintendent,
Barium Products, Ltd., Newark, California

EXPLORATION BY BARIUM PRODUCTS, LTD., a subsidiary of Food Machinery and Chemical Corp., was rewarded in 1948 by the development of two large barite deposits situated 28 miles south of Battle Mountain, Nev. The smaller of the two deposits, the Valley View claims, has been in production for two years and its operation is herein described. The larger deposit, Mound Springs, is in the development state and will be placed in production after Valley View has been mined out.

Development of Valley View indicates that the deposit is the erosional remnant of a massive replaced limestone bed, probably of Pennsylvania age. The ore, developed by 3,400 ft. of trenching, 50 ft. of shaft and 1,000 ft. of test drilling, strikes north 30 deg. east with an average dip of 25 deg. to the northwest. No hanging wall is apparent within the ore zone; however, to the north in undeveloped area, chert overlies the barite.

The footwall is a variable, contorted, incompetent Pennsylvanian chert. This material accounts for numerous variations in the ore thickness as its dip changes from 40 deg. near the crest of the exposure to 4 deg. near the middle of the deposit. The ore is exposed on a dip slope hillside with a strike length of 320 ft. and a dip-slope measurement of 380 ft. before it disappears into heavy alluvium. Ore depth varies from 5 to 56 ft. but averages 15 ft.

Standard Open-Pit Equipment Discarded

The standard method of open pit quarry was discarded because the marked undulations in the footwall would necessitate numerous small benches, several access roads, and comparatively long truck hauls to screening plant. With the assistance of Roger Pierce of Salt Lake City, Utah, a plan was evolved which would require a small crew, eliminate high capital cost equipment and reduce ore production costs. The equipment selected was a skid-mounted assembly of a 30MNM Ingersoll-Rand triple-drum tugger hoist, clutch connected to a 49-hp. 71 series, 2-cylinder, 2-cycle G. M. diesel engine.

Due to the flexibility of the unit no other equipment was required for pit clean-up. Additional equipment was a 265 Gardner-Denver compressor and an International K-7 pit truck.

Scrapers Substituted in Mining Plan

The slusher mining plan is extremely simple. Fortunately, the dip slope characteristics of the deposit make a downhaul for the slusher possible. This permits the use of a large scraper and low power requirement. The loading platform, 16x16 ft. with a 2-ft. x 12-in. loading hole, is constructed of five sets of 8x8-in. timber having 8-ft. clearance above road. It is situated near the center of the deposit to allow a maximum tonnage to be mined from one location.

From the platform an initial slot 20 ft. wide, and at depths ranging from zero at the ramp to 10 ft. at the upper end of the slot, was drilled and blasted. Production and ore shipments commenced with this first blast. Ore costs during the slot construction period were somewhat higher than later experienced due to the larger powder consumption in breaking the heavy barite out of the tight slot. After completion of the slot, drilling and blasting on alternate sides of the slot widened the pit.

With the widening of the pit the advantages of the triple-drum hoist became increasingly apparent. Variation in control frictions enables the operator to completely sweep and clean the entire pit floor, level ore trails, and load from various portions of the blast when blending is advisable. The two haulback sheave

SIDE-VIEW of diesel-powered scraper unit on ramp. Trucks haul ore from here to screening plant.

Pit Barite Mine

blocks are kept within 60 ft. of each other and some distance behind the orebody. This position of the sheave blocks aids in the maneuverability of the scraper and reduces cable tension. The maximum pit width from which the unit can economically operate without re-alignment is 200 ft., with a 220-ft. pull to the loading ramp.

Cable wear is the most bothersome item of the system. While it is not excessive because of the nonabrasive and brittle nature of the ore, it still necessitates constant maintenance and bi-monthly replacement. Wear is somewhat reduced by the elevation of the sheave blocks and by reversing the cable when wear first becomes apparent near the scraper. Some 500 ft. of ½-in. cable is used on the haulback drums and 225 ft. of ⅝-in. cable on the pull drum, with the pull cable usually showing the first signs of wear. Although little difference is found in the wearing qualities of the various cable makes and grades, the preformed improved plow steel cable with hemp center is more flexible and easier to work with, resulting in sufficient labor savings to warrant its purchase.

Two years of operation has demonstrated the operating economy of the diesel drive and the tugger hoist. The hourly consumption of the power unit while working is 1½ gal. of No. 1 grade diesel fuel. In spite of the dusty nature of the surface ore, the dust collector on the unit is ample to keep the oil clear of sludge. Temperature control of the motor is carefully watched and during cold weather a radiator curtain is used to hold the unit at its operating temperature of 160 deg. The only visible wear in the slusher unit is in the 3 pairs of rollers. This wear has been greatly reduced by using sheave blocks which guide the cable direct to the drums, rather than having the rollers take all of the scraper pull and haul back weight.

Drilling is done by one miner drilling fifteen 10-ft. vertical holes per shift. Medium-weight Ingersoll-Rand S-39 jackhammers are used with Type 1 side hole detachable jackbits. Bit size, contrary to the present trend, is large with starter bit size of 2½ in., bottoming the hole at 1⅞ in. or larger. While a smaller size bit is capable of drilling the hole much faster, there is insufficient clearance between the bit and hole to allow the heavy barite dust to be blown clear; hence considerable drilling time is lost in freeing the drill steel from the hole. With the large bit, drill speed through the high-grade barite is remarkably fast. Speeds of 1 f.p.m. are not uncommon and record runs of 250 ft. per day are found on the daily work sheet. Detachable bits often last for 800 ft. of drilling before reconditioning is necessary, and as the bits can be reground four times before discarding (steel breakage is almost negligible) the steel and bit cost is less than .005 cents per ton.

Costs for blasting barite for slusher operation are almost double that of a power shovel operation where the shovel is able to work directly against the shattered face. Here, only heavy powder charges are necessary at the toe of the bench. The slusher, utilizing a 42-in. Pacific semi-box scraper, is unable to dig into the fractured rock; therefore, the ore must be broken to minus 12 in. and blasted clear of the face. To accomplish this, holes are drilled on a diamond pattern at 3-ft. intervals, the maximum depth being 10 ft. Hole depth is determined by test drilling ahead of blasting, which eliminates the danger of breaking into the rolling chert footwall and subsequent contamination of the ore. Each hole will break approximately 11 tons of ore with 2.7 lb. of Hercomite 5X powder. The blasts are made on alternate sides of the slot and vary from 100 to 150 holes. All holes are shot with primacord which greatly aids fragmentation.

Job Diversification Solves Labor Problem

The success of the slusher system is best illustrated by a production average of 20 tons per manshift. Job diversification is obtained by paying premium wages with no job differential. When drilling lags, miner and truckdriver drill together. After a large blast with no drilling needed, the miner operates the slusher or helps with the screening plant. Throughout the operation the foreman assists whenever necessary. Actually, all equipment is not being utilized to its full capacity and with increased production demands, output can be expanded by 20% with additional manpower.

Ore is scraped into an International K7 6-yd. truck from the loading ramp. Loading time is approximately 5 min., as the slusher operator has scraped sufficient ore to the ramp during the truck's previous bin haul. This is a downhaul of about 1,200 ft. and a round-trip averages approximately 15 min. The present mining production rate is 25 tons per hour, which is about the maximum for the scraper at hauling distances of 200 ft. The pit truck dumps the ore into a 25-ton ore hopper and the ore is fed by a pan feeder onto a 3x6-ft. Symonds Type F horizontal vibrating screen driven by a Case gas engine. This screen is capable of screening up to 60 tons per hour but at present is regulated to 40 tons per hour. Screen size is varied depending upon the moisture content of the ore and can quickly be changed from 1/16 in. clear openings in dry weather to ¾ in. in wet weather. Screening is necessary only to eliminate the surface dirt from the ore and little sorting is necessary to meet company specifications of plus 90% $BaSO_4$.

Fines and ore are screened onto parallel 60-ft. conveyor belts and transported to a prefabricated 120-ton steel bin and later hauled to railhead.

Output of Most Ores Is Well Below Pre-War Levels

In 1940, Philippine Mining Reached This Production:

Material	No. of Mines	Output (met. tons)
Gold	49	1,100,262 oz.
Silver		1,407,871 oz.
Lead	1	944
Copper	2	11,088
Manganese ore	9	53,000
Chrome ore, ref.	8	80,770
Chrome ore, met.	8	108,311
Iron ore	4	1,255,985

In 1950, the Industry Still Had Far To Go To Catch Up:

Material	No. of Mines	Output (met. tons)	Net Change From 1940
Gold	10	333,991 oz.	— 69%
Silver		216,034 oz.	— 85%
Lead	1	879	— 7%
Copper	1	10,384	— 6%
Manganese ore	11	29,867	— 44%
Chrome ore, ref.	4	208,665	+159%
Chrome ore, met.	4	41,846	— 61%
Iron ore	3	599,095	— 52%

Why Philippine Mining Hasn't Come Back

The Philippines could do a lot to help relieve the free world's raw material shortages, but their mines must struggle merely to survive, let alone to expand. To see what's holding them back and what should be done about it, read John Huttl's eyewitness report on Philippine mining.

JOHN B. HUTTL
Associate Editor

HARASSED BY every conceivable difficulty, except lack of ore, the Philippine mining industry is indeed lagging behind the production records set just before the war. Yet so great are the obstacles thrown in the way, the wonder is that mining has made as good a come-back as it has. To remove these obstacles will be difficult, but it can be done.

However, do not expect that this account of Philippine mining will lead up to a suggestion that the United States must bail the Philippines out of their difficulties. The major part of the problem is local, and will have to be worked out by the new Republic, itself. The U.S. can, of course, help, but no one I talked to in the Islands favors any kind of assistance that would impair the Philippines' hard-won independence.

This estimate of the present situation in the Philippines is based on dozens of conversations in Manila and in the mining camps with men who know the circumstances because they are helping to shape them day by day. I am acting here as a reporter, bringing you the opinions and experiences of men whose lives are inextricably bound up with the future of the Islands.

Waiting for me at the airport in Manila were V. A. Brussolo, vice-president, and Homer A. Mann, consulting engineer, of Soriano & Co., and Lee Hinkley, of Marsman & Co. They saw to it that I was comfortably installed in the magnificent Manila Hotel. Here a sign on the registration desk reminds one sharply that security in the Philippines can not yet be taken for granted. It says: "No Weapons Allowed—Deposit Here."

Early next morning, I taxied to the City for appointments with Col. Andres Soriano, president of Soriano & Co.; his son, J. M. Soriano; Sebastian Ugarte, vice-president; and Walter Hecht, of the Philippine Association.

On the way I was struck by the unerased evidence of the terrible bombardment that flattened the Intramuros, or Walled City, during the fighting in 1945. Like Nurnberg in Germany, this 200-year-old gem of Spanish architecture was shattered and burnt to ashes, an estimated 350,000 persons dying with it.

Around Intramuros, splendid new Government buildings and apartment houses have risen, but inside the old city, reconstruction has been confined to several commercial buildings.

The area north of the Pasig River has been rebuilt, and Manila's famous Escolta Street is as crowded as ever. The old-time *carromatas* (two-wheeled, one-horse carriages) have to compete with numberless "Jeepies," skittering taxicabs with home-made bodies fondly made up to look like General Motors' Car of the Future. Traffic proceeds on a may-the-best-man-win basis. However, the various military and police check-points along the main streets are a reminder that the Huk problem has by no means been settled.

What the young Philippine Republic needs more than anything today is a dozen more men of the calibre of Don Andres Soriano and his son. One of the most respected industrialists in the Philippines, Don Andres' philosophy in regard to labor, working conditions, production methods, etc., are mirrored in the management and plant structures of the many enterprises he commands.

For example, he has brought

Philippine Air Lines from a small inter-island air line to the first-class international carrier it is today. He is a hard worker, an optimist, and a leader of men. His son is following in his footsteps.

In arranging trips to the Surigao, Baguio, and Acoje mining districts, I was greatly aided by Dr. Manuel Lim, chairman of Mindanao Mother Lode Mines, Inc.; V. E. Lednicky, president of Lepanto Consolidated Mining Co.; and Jesus S. Cabarrus, president of Acoje Mining Co., as well as Messrs. Ugarte and Brussolo.

I am particularly indebted for information on present conditions in the Philippines to Messrs. J. B. Stapler, manager; C. A. Weekly, chief metallurgist; and A. L. Velilla, secretary, of Marsman & Co.; Demetrio Andres, director of the Philippine Bureau of Mines; Nestorio N. Lim, secretary-treasurer of the Philippine Chamber of Mines; J. D. Cuyugan, general manager of Acoje Mining Co.; Sam Leitman, manager of the mining department of Luzon Stevedoring Co.; Fred E. Bezotte, diamond drill contractor; A. E. Perkins, noted lawyer and former president of Lepanto; M. R. Arick, of Edward J. Nell Co.; M. M. Aycardo, chairman of the Board of Examiners for Mining Engineers; and numerous representatives of U. S. manufacturers and bank officials.

At the office of the American Chamber of Commerce, I had a pleasant visit with A. V. H. Hartendorp, manager. I was introduced to and had brief chats with Carlos P. Romulo, Secretary for Foreign Affairs; Felino Neri, Acting Secretary for Foreign Affairs; Cornelio Balmaceda, Secretary of Commerce and Industry; and various dignitaries of the Roman Catholic Church, industrialists, businessmen, and others.

Crisis Impends

I have detailed the list of those whom I met in Manila so that the reader may know that when I say the Philippines is in a time of gravest crisis, I do not use this term lightly. It is a crisis that may well determine the survival of the new Republic.

To evaluate this crisis properly, one must have in mind the inherent rugged individualism of the Philippine people, and also their great differences in character and attitude from our own. I should like to quote, in part, the views of Jose A. Lansang, executive editor of the *Philippines Herald.*

"A careless scanning of the Philippine scene by the foreign visitor would give the impression that the influence of America had been profound and widespread. He would see Hollywood movies and the ubiquitous colored comics, or the posters of Coca Cola and Shell in the remotest villages. He would find English spoken, or at least understood, in the hills as well as in the lowlands. He would be struck by affluent residents in the provinces, dressed in the latest *Esquire* style.

"But he would be misled if he concluded from such visible indications that the Filipino thinks, lives, or acts like an American. The truth is that the most dominant influence on Filipino ways of thinking and acting is still that left by the long Spanish occupation. The Filipino is Western in outlook to the extent that he was made that way after more than three centuries' association with Spain.

"Despite intensive indoctrination in the American way of life over the past 50 years, the Filipino has but a shaky grasp on it. It is a little-remembered, but important fact that medieval Spain had greater similarity in physical circumstance with the pre-American Philippines than there has ever been between any phase of the American development and any phase of the Philippine story.

"Consider the basic social and economic problems of the Philippines that are engrossing the mid-century Filipino. Root of most of these problems is certainly the semi-feudal property relations, as well as practices, in the country's agriculture. Half a century of American tutelage barely disturbed the social and economic relationship in agriculture, which is the fundamental economic activity, as well as the only possible hope for salvation, of the Philippines.

"The Filipino's attitude toward wealth, manual labor, academic education, and social standing is

E. & M. J. Visits The Philippines

John B. Huttl

No stranger to travel, John Huttl, *E. & M. J.'s* West Coast editor, still wants it known that his recent flying trip to the Philippines was one of the pleasantest and most exciting experiences he's had in a long time.

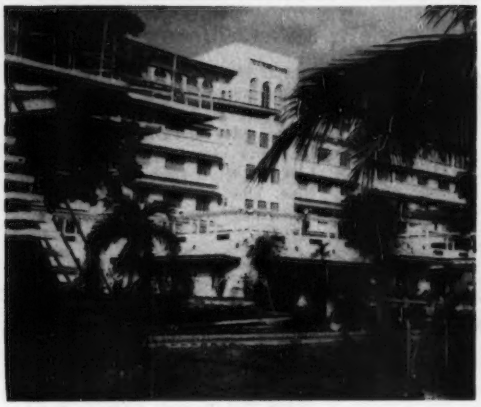
No one, and certainly not John, could fail to be stirred at the prospect of crossing the Pacific as a flat stone skips across a pond, touching down briefly at those tiny bits of dry land in between that only God and the navigator know where to find.

John left San Francisco for Manila at 11:55 a.m. on a Wednesday in a Philippine Air Lines DC-6. Refueling at Honolulu, Wake, and Guam, plus dodging a typhoon that was also headed for Luzon, took no more than the scheduled time, and he reached Manila at 3:10 p.m., Friday. Of his trip, John says:

"The service was truly excellent. The atmosphere on the airliner reminded me of that on board the trans-Atlantic liners before World War II. The crew made us part of the family, so to speak, soon after we took off, with a natural friendliness that is quite unusual in air travel. The equipment, of course, rivals that of any air line in the world. The Philippine Republic can certainly be proud of the impression made on travellers like myself by the Philippine Air Lines."

Made in less than three weeks, John's trip naturally depended heavily on air travel, and he came to be grateful for fast service and on-time arrivals. Here, in these few pages, is the substance of what he saw. This section of his report deals with the Philippine economy in general. We will present next month his detailed account of individual mines.

Luxury In Manila . . .



NEW WING of the Manila Hotel, recently completed, marks sharp contrast to war years. You can get a nice air-conditioned room for $17.50 daily. No hardship here!

. . . A Nipa Hut In Mindanao

ELSEWHERE things are pretty much the same. This dwelling in Mindanao is air-conditioned in the old way; future miners in front are cheerful and impish as ever.

Spanish rather than American. So is the reluctance to pioneer in experimentation and change. And yet, these are among the more serious handicaps to the building of a truly industrial civilization in the Philippines.

"A common failing of the Filipino mind, traceable to his mental conditioning during the Spanish occupation, is his inclination to take the form for the substance. This is the antithesis of the pragmatic attitude of the American mind that invariably tests an idea in practice and accepts it only if it does actually work."

The economic conditions prevailing currently in the Republic present grim realities despite any protestations to the contrary. Out in front as a problem is the unfavorable balance of international trade. This is estimated at several hundred million dollars a year, requiring imposition of drastic currency controls to avoid total exhaustion of the dollar reserves held by the Central Bank.

A 17% tax on sales of foreign exchange was put into effect on March 28, 1951, and the difficulties and extra tax burden imposed on commerce, industry, and mining are obvious. Added to these was an abrupt rise in the corporate income tax from 16% to 20% and 28%, retroactive to Jan. 1, 1951.

Compared with U.S. rates, which reached 45% last year, this rate does not seem high, but it has the effect of laying a heavier tax burden on the larger enterprises, many of which are foreign-owned, than it does on the smaller, Philippine-owned, companies. The tax also penalizes growth as well as size, even encouraging splitting companies up into smaller, less efficient units.

Gold mining companies also pay a graduated ad valorem tax on gold production ranging from 1½% to 10%, higher rates becoming applicable as production increases. All mines pay real estate taxes on their properties. Restrictions on imports have made regular supply of equipment and materials to the mines slow and difficult, and their cost has increased in proportion to the tax levied on foreign currency.

Equipment Needed

This need for machinery and equipment is one of the most pressing of the Republic's problems, according to Mr. Balmaceda, Secretary of Commerce and Industry. The objective is to bring about mechanization of farms and plantations, and to establish light consumer goods industries. The creation of jobs at good pay will, he feels, be the most powerful weapon in combating the influence of dissident elements such as the Huks. However, it can be seen that the job is not easy in view of the innate conservatism and reluctance to adopt new methods referred to in the quotation from Mr. Lansang.

Aside from interfering with the supply of machinery, currency restrictions have interfered in hiring of foreign technical help, and in hanging onto those already engaged. This exchange control law, as it now stands, works a special hardship on professional men such as mining engineers, who contribute the know-how in the development of industrial and mining enterprises. These men are an essential part of the success of such ventures and can not be spared. Their technical knowledge is fully as important to the industry as capital investment itself, and must be given such consideration. Unless corrected, there is bound to be an exodus of American technicians, with a consequent adverse effect on the much-needed influx of American capital investment.

A secondary effect of an eventual departure of American technicians, but no less a serious one, would be the loss of the opportunity for training Filipinos afforded by the presence of the Americans. The people are certainly talented and are eager to learn the newest and best techniques. However, there are too many of them being encouraged to aspire to white collar jobs, and too few setting out to learn trades. If industrialization of the country is to continue, there must be a greater supply than is now in the making of mechanics, electricians, plumbers, and other artisans.

Another uncertainty besetting mining is the price of gold. Mining companies have been permitted to sell 75% of their output in the free market in Manila, where the higher price thus obtained has alone enabled most gold mining companies to keep their heads above water.

Wages and cost of supplies and equipment have increased 2½ and 3 times since 1940. One executive

The Islands Need Transport . . .

AIRCRAFT are important to the Islands' economy. Here Albert Onstott, president of Pacific Airways, primes Norseman to take John Huttl from Zambales to Manila.

. . . And Power

DIESEL POWER keeps nearly all mines going. This is one of two new 850-hp. National Metal & Steel engines going in at Acoje Mining Co. Equipment is hard to get.

told me that his cost per man-shift in 1941 was P1.71; in 1951, it is P3.07, and still rising.

In recent weeks, the Government has seen fit to crack down on the Chinese buyers of gold, who alone supported the Manila free market. With no buyers coming forward, mining companies have been forced to sell their gold to the Central Bank at the $35 price. Operating costs of most of them run well above $35 an oz. of gold produced. Unless the Government permits free gold buying once more, gold miners are up against it.

Not least of mining's problems is the Huk movement. Several mines have had personnel shot and buildings burned by these raiders. Some believe that the Huks are out-and-out Communists. Others believe they are merely a group of disgruntled elements, who felt unfairly treated after the war, and who are manipulated by a small central Communist group. In either case, the Huks must be put down and the Army has started drastic action against them in recent months, under Ramon Magsaysay, Secretary of Defense.

As to the matter of registration of engineers, M. M. Aycardo, Jr., chairman, Board of Examiners for Mining Engineers, told me that the Registration Act is similar in scope and field to acts adopted in several states in the U. S. A. In fact, the Philippine professional engineering law was patterned after U. S. state laws. He also stated that out of 307 registered mining engineers in the Philippines, 53.5% of this number are foreigners and 66% of this total are graduates of non-Philippine schools (U. S. and foreign schools), and that there is no truth in the belief that foreign engineers are not welcome in the Philippines. On the contrary, the more there are, the better for the mining industry, for through these engineers local graduates will have an opportunity to acquire wider experience and training in mining engineering.

Pessimism Unwarranted

The aforegoing are some of the difficulties confronting the mining industry and others at the time of my visit in May. A good deal of pessimism prevailed in many quarters, but looking at the situation objectively and with realism, the feeling of "it's no use" is not quite justified, and for many reasons. Also, the present Government is not wholly responsible for the current crisis, but contributed to it by not providing firm leadership and applying controls somewhat late in the day and too abruptly.

One must remember that Philippine independence came on top of four years of Japanese occupation, followed by the upheavals of the liberation. The Islands received a flood of American dollars, which through various mistakes, like the war surplus fiasco, fanned the fires of inflation. Goods and supplies were, and are, inadequate to match the flow of money.

Proper guidance and a little forethought at this time could have averted, or at least eased, the present situation. Six years is simply not long enough to build up the kind of competent organization it takes to handle a government in a difficult time. As in all countries there is in the Philippines a copious supply of politicians and statement makers, but few statesmen.

Government control, nationalization of industry, welfare measures, all the liberal experiments tried by older nations, have a fatal attraction for the leaders of younger nations like the Philippines. Its government has tried to establish such reforms all at once, without investigating the capacity of the country to support them.

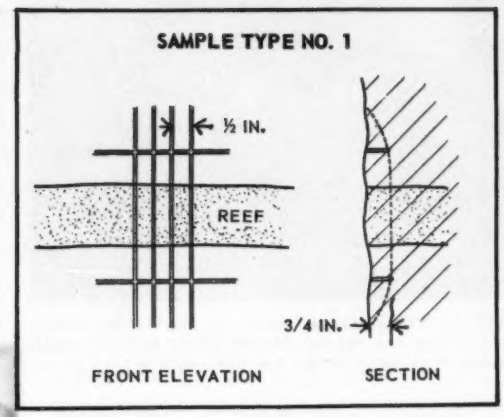
Nevertheless, foreign missions and experts called in to provide help, will do well to look at the difficulties through Philippine eyes, and not try at once to make over the Islands into their own country's image.

What's Needed

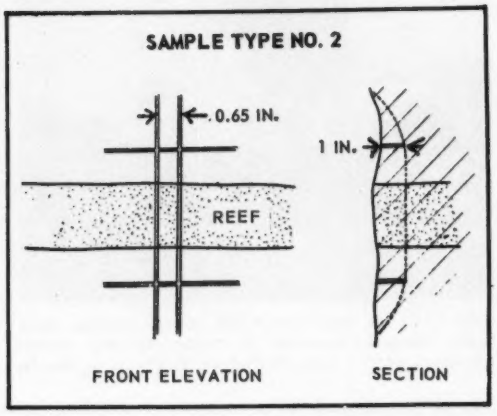
In sum, then, here are the things that must be done to bring about early improvement in the present situation:

1. Restore law and order throughout the Republic.
2. Rehabilitate raw materials industries.
3. Ease currency controls for purchase of equipment and for payment of salaries to foreign experts and technicians.
4. Re-examine current tax laws.
5. Reform the land laws.
6. Launch careful programs of industrialization.
7. Remove uncertainty on price of gold.

OPERATING IDEAS



IN THIS TYPE of sample, twin rows of parallel slots are cut, yielding three ½ x ¾-in. channel sections.



A SINGLE PASS with double diamond-impregnated wheels yields a 1 x 0.65-in. channel section of the vein.

Channel Sampling with Diamond Impregnated Wheels

A new method of cutting channel samples has been under investigation for the past two years on the Witwatersrand and in the Orange Free State. Thin, diamond-impregnated wheels are used to cut narrow slots, spaced 1 in. apart to depths of 1½ in. across the ore section. The sample is then readily removed by driving a wide, sharp-edged chisel into one of the parallel slots, thus breaking off the isolated rock section at the bottom of the cut.

For cutting quartzite, two 8-in. diamond-impregnated wheels are mounted 1 in. apart on a single spindle. They are rotated by a 2-hp. vane-type air motor at speeds of about 6,000 surface ft. per minute. The cutting head follows the contour of the rock by means of a depth gage, or by visual observation of the depth gage marks on the cutting wheel.

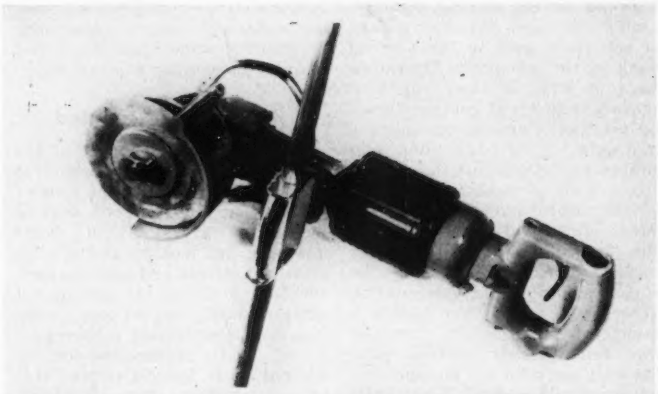
The present wheels are only 0.035 to 0.045 in. thick. In quartzite they will cut at a rate of 4 to 6 in. per minute when two parallel wheels are used.

For underground operations it is necessary to have electric power or compressed air to operate the cutting machine and water to cool the cutting wheels. Water may be carried in a portable pressure tank.

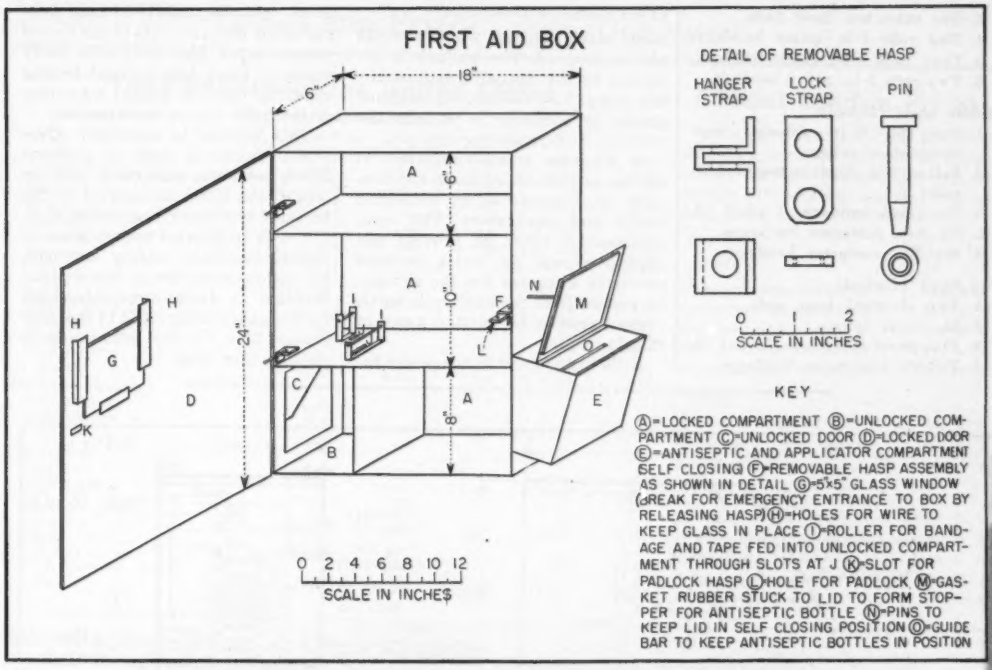
The method as compared with hand moiling has the advantage of speed and elimination of human errors, particularly in veins of varying hardness.

Early test machines weighed 100 to 150 lbs., and were mounted on light telescopic bars, but the latest model provides a hand-held machine weighing only 19½ lb. guided by a light support column. Lightweight portable channel sampling machines for surface channel sampling also have been tested. For this work small 2-hp. gasoline motors are used with a flexishaft drive to which the cutting wheels are attached.

The new sampling technique was first carried out by Union Corporation, Ltd. in the Johannesburg area, and later by other major groups. Steps are being taken to experiment with this equipment in United States, Mexico, and Canada. E&MJ is indebted to William St. Clair, mechanical engineer of Johannesburg, South Africa, and John Q. St. Clair, mining geologist, for this information.



HAND MOILING is replaced by this air-powered unit (called the St. Clair sampler) supporting two diamond-impregnated wheels which cut thin parallel slots across the vein.


FIRST AID BOX
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SCALE IN INCHES
DETAIL OF REMOVABLE HASP
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LOCK STRAP
PIN
0 1 2
SCALE IN INCHES
KEY
Ⓐ=LOCKED COMPARTMENT Ⓑ=UNLOCKED COMPARTMENT Ⓒ=UNLOCKED DOOR Ⓓ=LOCKED DOOR Ⓔ=ANTISEPTIC AND APPLICATOR COMPARTMENT SELF CLOSING Ⓕ=REMOVABLE HASP ASSEMBLY AS SHOWN IN DETAIL Ⓖ=5"×5" GLASS WINDOW (BREAK FOR EMERGENCY ENTRANCE TO BOX BY RELEASING HASP) Ⓗ=HOLES FOR WIRE TO KEEP GLASS IN PLACE Ⓘ=ROLLER FOR BANDAGE AND TAPE FED INTO UNLOCKED COMPARTMENT THROUGH SLOTS AT J Ⓚ=SLOT FOR PADLOCK HASP Ⓛ=HOLE FOR PADLOCK Ⓜ=GASKET RUBBER STUCK TO LID TO FORM STOPPER FOR ANTISEPTIC BOTTLE Ⓝ=PINS TO KEEP LID IN SELF CLOSING POSITION Ⓞ=GUIDE BAR TO KEEP ANTISEPTIC BOTTLES IN POSITION

First Aid Cabinet Prevents Loss of Supplies

JOHN H. DISMANT
Research Fellow, Engineering Experiment Station, University of Utah

Maintenance of supplies in first aid cabinets is often very difficult because of faulty design. This unit was designed by the author while working for the New Jersey Zinc Co., Gilman, Colo., in 1947. The cabinet resulted in savings of more than two-thirds of the first aid supplies formerly required, and permitted a more effective dispensing of the supplies. It proved so successful, in fact, that it was installed in all first aid stations in the mine, mill, and shop.

The cabinet is divided into two major parts, one which provides supplies for major injuries, and one for minor injuries. The compartment containing supplies for minor injuries is unlocked, whereas supplies for major injuries are under padlock. However, in an emergency, the padlocked compartment can be opened without a key. This is accomplished by use of a special hasp (F) which can be released by breaking a small glass window (G). The special hasp consists of a flat strap of steel, held in place by a U-shaped

(Text continued on p. 86)

Sign under First Aid sign reads:
"Keys for this first aid box held by all bosses, hoistmen, cagers."

Sign on left side of box reads:
"Side opening. Bandage, tape, eye-wash, Band Aids, ammonia-inhalers."

Sign on container to the right reads:
"Merthiolate and applicators—Opening on top."

Sign behind the glass window reads:
"For emergency only. In absence of key to release door—Break glass. Pull this pin."

What the shelves contain:

Bottom Shelf.

The unlocked compartment holds:

1. **A box with Band Aids and ammonia inhalers.**
2. **Adhesive tape and bandage fed from roller above.**
3. **Eye glass and eye wash.**
4. **Scissors on chain.**

The right hand locked section holds:

1. **Three 5-yd. rolls adhesive tape.**
2. **One extra box ammonia inhalers.**

(List continued on p. 86)

3. One extra box Band Aids.
4. Two rolls 1-in. gauze bandage.
5. Four rolls 2-in. gauze bandage.
6. Two rolls 3-in. gauze bandage.

Middle Shelf (locked)

1. One roll ½-in. adhesive tape mounted on roller.
2. Roll of 2-in. bandage mounted on roller.
3. Six gauze bandages 1 yd.x1 yd.
4. Six 3-in. compress bandages.
5. Six 2-in. compress bandages.

Top Shelf (Locked)

1. Two chemical heat pads.
2. Six finger splints.
3. Five picric acid gauze, 1 yd.x1 yd.
4. Fifteen triangular bandages.

(Text continued from p. 85)

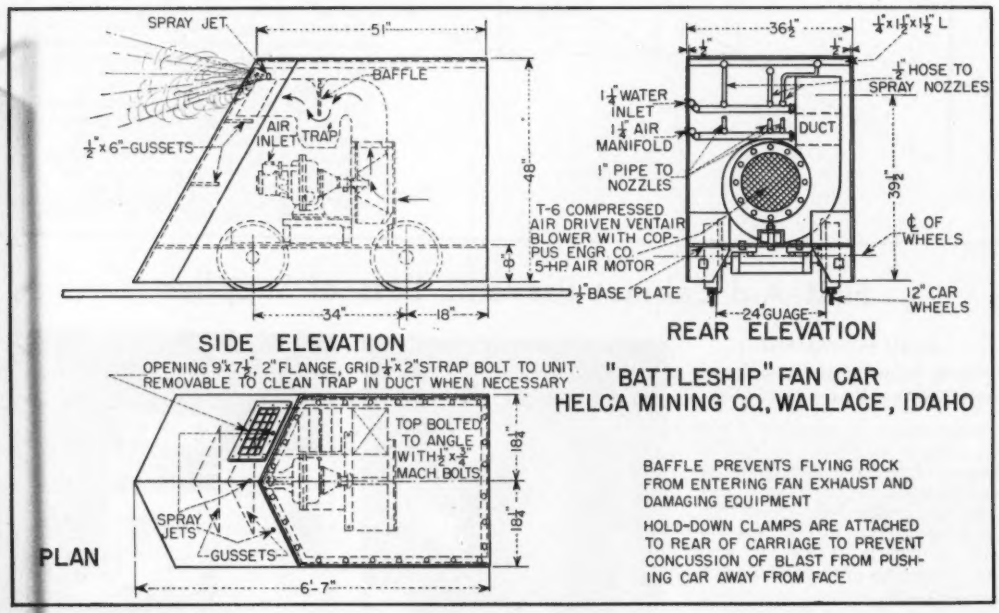
metal strap through which a metal pin is dropped. The padlock is attached to the opposite end of the flat strap. The assembly is released simply by reaching in through the window and removing the pin.

A separate small compartment on the outside of the main box provides easy access to an antiseptic bottle and applicators. The compartment is tilted to provide self closing of the lid which in turn serves as a stopper for the antiseptic bottle. Thus the antiseptic bottle cannot readily be carried away or misplaced.

Rolls of tape and bandage are fed down into the unlocked main compartment through slots in the locked compartment. Men thus have ready access to Band Aids without feeling the great need to pocket a number of them for future emergencies.

This cabinet is especially effective if placed in sight of someone like a hoistman, pumpman, mill operator, etc. Keys are carried by the foreman and other designated men.

I wish to express appreciation to Harold Robinson, safety engineer, for helpful criticism of this design; William L. Jude, superintendent, for his cooperation; and to the New Jersey Zinc Co. for permission to publish this idea.



"Battleship" Fan Car Clears Tunnel Face of Gases

Clearing a tunnel face of gases after a blast is a major problem chiefly because auxiliary ventilation equipment must be installed far enough back from the face to prevent damage by flying rock. Hence it cannot stir up the gases at the face sufficiently to clear them out quickly. Ralph Neyman, general superintendent of Hecla Mining Co., Wallace, Idaho, solved this problem at the Rock Creek tunnel project by installing a "battleship" fan car which is clamped to the rails 30 to 35 ft. back of the face. Air and water hoses are turned on prior to the blast. This unit stirs up the gases so that they can be picked up by a ventilation duct connected to a main fan.

The car contains a V-shaped armor plate to protect an air-turbine fan and three jets mounted on the carriage. The jets discharge air and water at the face at high velocity. High-velocity air from the fan helps carry the mist over the blasted muck pile. At the same time suction from the main air duct installed in the back of the tunnel removes circulating gases stirred up by this equipment.

Note the special baffle plate installed in the blower duct. This prevents any stray pieces of muck from flying into the blower.

In practice, it was necessary to circulate the air in this manner while the main fan was on suction for approximately 10 min. Then the main fan was reversed, and fresh air was blown through the duct to the face. Advantages were: (1) Miners were able to return to the face to resume work much faster, and (2) Working conditions at the face were vastly improved.

MARKETS—Trends and Prices *(Continued from page 53)*

Lead Imports of the United States

(Bureau of the Census)

Ore, etc. (content):	In Tons Jan.-Dec. 1950	Feb. 1951	Mar. 1951	Apr. 1951	May 1951
Canada	9,429	507	411	476	384
Mexico	2,846	189	247	334	310
El Salvador	419	32	31	47	16
Guatemala	325	125	369	9	341
Honduras	412	28	49	23	24
Bolivia	13,381	2,522	..	453	2,622
Chile	2,656	316	...	46	...
Ecuador	407	...	...	...	...
Peru	16,011	1,474	...	2,783	276
Union of South Africa	18,509	...	...	1,549	2,160
Philippines	912	106	...	95	60
Australia	9,730	...	356	808	1,208
Other countries	251	16	21	12	...
Total	75,288	5,315	1,484	6,635	7,401
Base bullion (content)					
Australia	2,309	...	...	...	...
Other countries	1,248	...	...	...	...
Total	3,557	...	...	...	...
Pigs and bars:					
Canada	107,672	6,529	5,440	8,780	2,937
Mexico	220,765	1,126	1,903	1,401	1,633
Peru	31,989	500	1,947	3,653	2,950
Germany	8,642	...	...	53	...
Yugoslavia	43,854	3,054	3,632	4,248	2,357
Japan	5,668	...	...	...	...
Australia	22,008	...	...	1,680	56
Other countries	1,143	...	...	...	...
Total	441,741	11,209	12,922	19,815	9,933

Official London Prices

Consumers in the United Kingdom obtain copper, lead and zinc at prices named by the British Ministry of Metals. Delivered prices in effect as July ended were as follows:

	Per Long Ton £	s.	d.
COPPER:			
Electrolytic, high conductivity	234	0	0
Fire refined, high conductivity	234	0	0
Fire refined, high grade	233	10	0
Fire refined, min. 99.7 percent	233	0	0
Fire refined, min. 99.2 percent	232	10	0
LEAD:			
Soft, foreign duty paid	180	0	0
Soft, Empire	180	0	0
English, refined	181	10	0
ZINC:			
Foreign (G.o.b.) duty paid	190	0	0
Domestic (G.o.b.) duty paid	190	0	0
Prime Western and debased	190	0	0
Refined and electrolytic	194	0	0
Minimum 99.99 percent	196	0	0

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York unless otherwise stated

MISCELLANEOUS METALS

July 31, 1951

Aluminum, ingot, 99 plus percent, lb. (base price)	19c.
Antimony, spot, lb., 5 tons and up but less than carload in cases	45.300
Bismuth, ton lots, lb.	$2.25
Cadmium, commercial sticks, delivered, lb.	$2.55
Calcium, lb., ton lots, 98 percent, cast	$2.05
Chromium, 97 percent grade, lb., contract	$1.07
Cobalt, 97 to 99 percent, per lb.	$2.10
Indium, troy oz.	$2.25
Nickel, cathodes, lb., f.o.b. Port Colborne (a)	56½c.
Magnesium, 99.8 percent, carloads, lb., producer's plant, Freeport, Texas	24½c.
Palladium, troy oz.	$24.00
Platinum (Official quotation wholesale lots) troy oz.	$90.00
Quicksilver, flask of 76 lbs., 25 flasks or more	$205 @ $210
Selenium, 99.5 percent, lb.	$3.00
Silicon, minimum 97 percent, spot, carloads, lb.	20c.
Tellurium, lb.	$1.75
Thallium, 100 lb. or more, lb.	$12.50
Titanium, 96 to 98 percent, lb.	$5.00

(a) Includes U. S. duty.

METALLIC ORES

Beryllium Ore, imported, 10 to 12% BeO, per unit	$32.00
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry	
44% Cr_2O_3, no ratio	$27.00 @ $28.00
48% Cr_2O_3, 3 to 1 ratio	$43.00 @ $52.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$8.70
Mesabi bessemer	$8.45
Mesabi, non-bessemer	$8.30
Lead (Galena), 80 percent, Joplin, Mo., ton	$218.42
Manganese Ore—Per long ton unit of Mn basis 48 percent manganese, nearby positions, subject to premiums and penalties, $1.10., c.i.f. U. S. ports, duty extra. Long-term contract quotations wholly nominal and matter for negotiation.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	60c.
Tantalite, 60% concentrate, per lb.	$2.00 @ $2.50
Tungsten Ore, per unit of WO_3	
Foreign, 60 percent, U. S. equivalent, duty extra	(a) $65.00 @ $68.50
Domestic, scheelite, 60 percent f.o.b. mine	$65.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	31c.
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton	$115.00

(a) F. o. b. port of shipment.

METALLIC COMPOUNDS

Arsenious Oxide (arsenic trioxide) lb., in bbl. carload lots delivered	6½c.
Cobalt Oxide, 72%, metallurgical grade, per lb. of Co	$2.25
Copper Sulphate, 100 lb.	$8.95

ALLOYS

Beryllium Copper, 4 percent Be, per lb. of alloy, 5 lb. ingot	$1.56
Ferrochrome, 65 to 69 percent, per lb. of Cr contained	21¾c.
Ferromanganese, 78 to 82 percent, gross ton, seaboard	$185.00
Ferromolybdenum, 55 to 65 percent Mo. lb. of Mo. contained	$1.32
Ferrosilicon, 50 percent, per lb. of contained Si	12.4c.
Ferrotungsten, 75 to 80 percent, lb. of W contained	$5.00
Ferrovanadium, per lb. of V delivered	$3.00 @ $3.25
Silicomanganese, max. 1½ percent carbon, per lb. contracts	9.9c.
Spiegeleisen, per long ton, 19 @ 21 percent grade	$75.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds), ton:	
Crude No. 1	$960 @ $1,500
Crude No. 2	$595 @ $900
Spinning fibers	$275 @ $475
Shingle fibers	$123 @ $170
Paper stock	$85 @ $119
Waste	$63 @ $70
Shorts	$30 @ $63
Asbestos, Vermont, f.o.b. Hyde Park:	
Spinning fibers	$254.10 @ $274.45
Shingle stock	$122.65 @ $148.50
Paper stock	$86.90 @ $106.15
Waste, stucco or plaster	$64.90
Refuse or shorts	$31.20 @ $57.60
Barytes, f.o.b. mines:	
Georgia, crude, per long ton	$13.00 @ $13.50
Missouri, 93 to 94 percent $BaSO_4$, per short ton	$9.25 @ $9.50
Bauxite, long ton, f.o.b. point of shipment:	
Domestic, crude, 50 to 52 percent (not dried)	(a) $4.50 @ $5.50
Domestic, chemical, 55 to 58 percent	(a) $8.50 @ $9.50
Domestic, abrasive, 80 to 84 percent	(a) $18.00 @ $18.50
China Clay, f.o.b. mines, ton:	
Georgia, filler and ceramic grades	$8.50 @ $9.50
North Carolina ceramic grade	$20.25 @ $22.25
Feldspar, bulk ton:	
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50 @ $22.25
Glass feldspar, white, 20 mesh	$11.75 @ $12.50
Fluorspar, f.o.b. mines, bulk, Kentucky and Illinois, 70% effective, CaF_2 ton	$43.00
Acid, 97% concentrate, bulk, ton	$50.00
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00 @ $14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington	$36.30
Mica—Domestic, f.o.b. mines. Punch 12 to 22c. per lb. according to size and quality. Sheet, clear, 1½ x 2 inch, 80 to 85c.; 2 x 2 inch, $1.10 to $1.20; 2 x 3 inch, $1.50 @ $1.60; 3 x 3 inch, $1.80 @ $1.90; 3 x 4 inch, $2.20; 3 x 5 inch, $2.40; 4 x 6 inch, $3.15; 6 x 8 inch, $4.25. Wet ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $32.50 @ $70.00 per ton. Scrap, $32 and up.	
Ocher, Georgia, ton, in sacks	$24.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	(a) 14c.
Sulphur, Texas, mines, long ton	$22.00
Talc, f.o.b. works, ton:	
New York, purified	$18.50 @ $20.00
Vermont, extra white	$12.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$30.00

(a) Nominal.

IRON AND STEEL

Pig iron, gross ton, basic, Valley furnaces	$52.00
Steel, f.o.b., Pittsburgh billets, net ton	$56.00
Structural shapes, 100 lb.	$3.65

WASHINGTON IMPACT

Balance Sheet on Minerals Outlook Shows but Few Deficiencies

DMA has added current production, expansion programs already approved, and some plans for further expansion which appear workable, to come up with a guess about the supply of minerals by the end of 1953. There have to be plenty of guesses about production in such figures. There are even greater guesses about total demand, when military programs play such an important part. If the shooting is over in Korea, some military demands might slacken off. But if Congress votes the money for an increase in the air force from 95 to 150 groups—as now proposed—demand for many critically short metals would rise over the present rate. These estimates of DMA are based on the military program now on the books. The figures weren't put together with any idea that they can be exact. But they can be used as a rough guide to current thinking about minerals production in the Government. Where the supply looks easy by end-1953, it's a good guess that the Government won't be pushing very hard for further expansion.

TITANIUM. Only 15% of demand will be fulfilled. DMA tries to estimate demand at the current rate of producing sponge metal—$5 per lb. If the cost can be lowered to around $1—as the Navy thinks possible—then demand will increase greatly.

IRON ORE: Supply expected to be 6% less than demand.

LEAD: Only a fraction of 1% less than demand. Expansion already approved will supply 35,000 tons a year.

ZINC: Supply will be equal to the high 1951 demand. Approved expansion is expected to supply about 90,000 tons a year.

NICKEL: Supply equal to 1951 demand.

MOLYBDENUM: Equal to 1951 demand. Approved expansion projects expected to provide 8,000,000 lbs. per year.

MANGANESE: Current supplies

BOX SCORE FOR DEFENSE MINERALS

(July 23, 1951)

Amortization applications received	380
Amortization applications approved by DMA	180
Amortization applications completed cleared	60
Purchase-contract applications received	43
Purchase contracts approved by DMA	17
Purchase contracts completely cleared	4
Exploration-contract applications received	480
Exploration contracts cleared	64

AMORTIZATION PROJECTS CLEARED

(July 13, 1951)

Company	Location	Mineral	Amount	%
Reynolds Aluminum Co.	Jones Mill, Ark.	Alumin.	$ 4,670,000	80
Aluminum Ore Co.	Bauxite, Ark.	Alumin.	53,900,000	80
Paul Lime Plant	Paul Spur, Ariz.	Lime	45,000	76
Phelps Dodge Corp.	Bisbee, Ariz.	Copper	12,401,435	75
Am. Smelting & Rfg Co.	Selby, Calif.	Zinc	2,254,000	60
Kaiser Al. & Chem. Corp.	Salinas, Calif.	Dolomite	1,173,000	85
Kaiser Al. & Chem. Corp.	Moss Ldg., Calif.	Refrac.	915,000	70
Climax Uranium Co.	Outlaw, Colo.	Uranium	174,000	90
Climax Uranium Co.	Grand Jct , Colo.	Uranium	909,000	90
New Jersey Zinc Co.	Canon City, Col.	Lead-Zn	100,000	60
Climax Molyb. Co.	Climax, Colo.	Moly.	9,274,000	75
Union Carbide & Carbon	Rifle, Colo	Tungsten	55,000	60
E. I. Dupont de Nemours	Newport, Del.	Titanium	1,227,000	90
Alcoa Mining Co.	Rosiclare, Ill.	Fluorsp.	376,226	80
Standard Lime & Stone Co	McCook, Ill.	Refrac.	679,000	85
Pittsburgh Metallurg. Co.	Calvert Cy., Ky.	Ferrosil.	1,817,540	85
Kaiser Al. & Chem. Corp.	Baton Rouge, La.	Alumin.	3,000,000	80
Kaiser Al. & Chem. Corp.	New Orleans, La.	Alumin.	70,000,000	80
Standard Lime & Stone Co.	Manistee, Mich.	Refrac.	236,000	85
W. S. Moore Co.	Virginia, Minn.	Iron	175,000	85
St. Joseph Lead Co.	Herculaneum, Mo.	Lead-Zn.	2,478,898	60
Harvey Machine Co.	Kalispell, Mont.	Alumin.	94,700,000	85
Jones & Laughlin Ore Co.	Star Lake, N. Y.	Iron	3,500,000	85
National Lead Co.	Tahawus, N. Y.	Iron	475,000	85
Aluminum Co. of America	Massena, N. Y.	Alumin.	4,068,000	95
Northwest Magnesite Co.	Cape May, N. J.	Refrac.	5,787,000	85
Titanium Metals Corp.	Henderson, Nev.	Titan.	14,163,000	90
Kennecott Copper Corp.	Ruth, Nev.	Copper	4,100,000	85
Basic Refractories, Inc.	Gabbs, Nev.	Magnes.	2,126,400	75
Carolina Aluminum Co.	Badin, N. C.	Alumin.	295,000	95
Standard Lime & Stone Co.	Woodville, O.	Refrac.	22,000	85
Dolite Co.	Gibsonburg, O.	Refrac.	837,000	85
Reynolds Aluminum Co.	Troutdale, Ore.	Alumin.	475,000	80
Bethlehem Cuba Mines	Chester, Pa.	Iron	4,037,000	85
Bethlehem Cuba Mines	Cornwall, Pa.	Iron	77,000	85
Bethlehem Cuba Mines	Morgantown, Pa.	Iron	34,343,000	85
J. E. Baker Co.	York, Pa.	Refrac.	2,039,000	85
National Gypsum Co.	Bellefonte, Pa.	Lime	1,270,000	75
Harbison-Walker Co.	Clearfield, Pa.	Refrac.	925,000	85
Aluminum Co. of America	Alcoa, Tenn.	Alumin.	912,000	80
Aluminum Co. of America	Port Lavaca, Tex.	Alumin.	34,000,000	80
Aluminum Co. of America	Calhoun Co., Tex.	Alumin.	5,209,000	80
Reynolds Metal Co.	Corpus Christi, T.	Alumin.	78,365,000	80
Kaiser Al. & Chem. Corp.	Spokane, Wash.	Alumin.	5,871,000	80
Aluminum Co. of America	U. S. at large	Alumin.	59,900,000	80
Reynolds Jamaica Mines	Jamaica	Bauxite	14,496,298	80

EXPLORATION CONTRACTS CLEARED

(June 30, 1951)

Company	Location	Minerals
I. W. Kusisto	Yavapai Co., Ariz.	Lead
Banner Mining Co.	Pima Co., Ariz.	Copper
Westmoreland Manganese Co.	Batesville, Ark.	Manganese
Philip Carey Mfg. Co.	Nevada Co., Calif.	Asbestos
Black Rock Min. Corp.	Mono Co., Calif.	Tungsten
Callahan Zinc-Lead Co.	Gunnison Co., Colo.	Zinc-lead
Lupton Mining Co.	Clear Creek Co., Colo.	Lead-zinc
Lead Carbonate Mines, Inc.	San Juan Co., Colo.	Lead-zinc
Frank Landauer	San Juan Co., Colo.	Lead-zinc-copper
Silver Bay Mines, Inc.	San Juan Co., Colo.	Zinc-lead
S helby-Johnson Mines	Park Co., Colo.	Zinc-lead
United Oil & Dev. Co.	San Juan Co., Colo.	Lead-zinc-copper
Cadwell Mining Co.	Lake Co., Colo.	Zinc
Boulder Tungsten Mines, Inc.	Boulder Co., Colo .	Tungsten
J. A. & B. A. Smith	Clear Creek Co., Colo.	Zinc
Bonita Min. & Dev. Co., Inc	San Juan Co., Colo.	Lead-zinc
G. L. & A. B. Beardsley	Custer Co., Colo.	Zinc
Utze Lode Co.	Chaffee Co., Colo.	Lead, zinc
United Minerals Res. Corp.	Blaine Co., Idaho	Lead, zinc
Hermada Mining Co.	Elmore Co., Idaho	Antimony
Day Mines, Inc.	Wallace, Idaho	Lead-zinc-copper
Bradley Min. Co.	Lemhi Co., Idaho	Tungsten
Bootman & Boswell Min. Co.	Lawrence Co., Mo.	Zinc-lead
National Lead Co.	Madison Co., Mo.	Co-Ni-Pb-Cu
Taylor-Knapp Co.	Granite Co., Mont.	Manganese
Alps Min. & Mfg. Co.	Granite Co., Mont.	Tungsten
Key & Durand	Granite Co., Mont.	Zinc-lead
David G. Wood	Douglas Co., Nev.	Tungsten
Bristol Silver Mines, Inc.	Lincoln Co., Nev.	Zinc
J. A. Madison	Mineral Co., Nev.	Tungsten
National Lead Co.	Fort Bend Co., Tex.	Sulphur
Chief Consol. Min. Co.	Tintic, Utah	Lead-zinc
New Park Mining Co.	Park City, Utah	Lead-zinc-copper
Combined Metals Red. Co	Tooele Co., Utah	Lead-zinc
Naildriver Min Co.	Park City, Utah	Lead-zinc
Park Utah Consol. Mines Co.	Park City, Utah	Lead
Ruberoid Co.	Orleans Co., Vt.	Asbestos
Flintkote Co.	Orleans Co., Vt.	Asbestos
Philip Carey Mfg. Co.	Orleans Co., Vt.	Asbestos
Mines Management, Inc.	Stevens Co., Wash.	Zinc
Kelly Camp Tungsten Co.	Ferry Co., Wash.	Tungsten
Black Warrior Co., Inc.	Chelan Co., Wash.	Lead-zinc-copper
Dodgeville Min. Co.	Iowa Co., Wis.	Lead-zinc
Dodgeville Min. Co.	Iowa Co., Wis.	Zinc
E. P. Scallon	Grant Co., Wis.	Lead-zinc
Vinegar Hill Zinc Co.	Lafayette Co., Wis.	Zinc
Continental Sulphur & Phosphate Co.	Park Co., Wyoming	Sulphur

are considered to be adequate. Recovery from slag may be in operation commercially by the end of 1953.

ALUMINUM: Production is expected to equal 1951 demand and to supply a pre-Korean rate of use for civilian industry before the end of 1953. Recent addition of bauxite to the list of minerals which can qualify for Government exploration money indicates additional mine production is wanted.

CHROMITE: Like manganese, in fairly easy supply due to imports. No shortage foreseen if the sea lanes remain open. Problem is transportation, not production.

COPPER: Expected to be 15% under demand despite an increase in production. Projects approved so far are expected to provide 139,000 tons of additional output.

TUNGSTEN: The Government's guaranteed purchase price of $63 per unit—while expected to stimulate production—won't supply enough to close the gap between supply and demand. The world-wide shortage is expected to last indefinitely.

COBALT: Supply will remain far behind demand as now forseen.

Brief, But Important

ASSESSMENT WORK—House committee has killed bill calling for delay in deadline to Oct.-Nov.

TUNGSTEN—Preparedness Program (Johnson) Committee rapped Defense Establishment for delays and—primed by OPS leftists—hit DMA for establishing floor price instead of subsidies, and for failing to stimulate foreign tungsten.

MANGANESE—General Services purchase depots will soon be ready at Butte, Mont., Deming, N. M., and Philipsburg, Mont., to buy 12,000,000 units over a 5-year period.

INTERNATIONAL ALLOCATIONS—Tough nut to crack on tungsten was price, finally settled at $55 floor, $65 ceiling. Moly was settled on current U.S. price.

Congress Dissatisfied Over Progress in Defense Minerals

You'll hear more charges of confusion and split-authority in the Defense Minerals program. For one thing, the hurriedly offered amendment to the Defense Production Act, which would have created a single, top authority over metals, got a 40% favorable vote in the House of Representatives—an indication that Congressional tempers are getting short regarding minerals expansion and acquisition. Equally significant, the Defense Minerals Administration is beginning to defend itself against its critics—and DMA's lack of clear-cut authority is its first line of defense.

The proposed amendment to the Defense Production Act got the support

(*Continued on p. 98*)

LABOR THIS MONTH

Joseph M. Gambatese, McGraw-Hill Washington News Bureau

CIO OBJECTIVE: Strike at AS&R's Garfield smelter underscores CIO steel union's effort to force steel industry customs on metal mining. One of these is "correction of wage inequities." It's been under way in steel since end of World War II. At Garfield, union admits it would cost minimum of 20¢ an hour, average; would raise some skilled rates 45¢.

CIO VS. MINE-MILL: CIO's need to "deliver the goods" and show up Mine-Mill delayed settlement, shifted dispute to Washington. Garfield local was among first to repudiate Communist leadership, was with Provisional Metal Council and Shipbuilding Workers before tying to Steelworkers.

MINE-MILL THREATENS: Mine-Mill can't let CIO steal the show. But it's willing to await outcome of CIO strike efforts. Meanwhile, it accuses mining industry of "stalling" and threatens to strike for above-ceiling wage increase.

MANPOWER: Experience during World War II and recent trends are carefully analyzed in Bureau of Labor Statistics article, "Manpower Trends in the Mining Industry," in August issue of *Monthly Labor Review*, BLS publication.

NON-COMMUNIST OATHS: NLRB's decision against UAW-CIO at Ford's forge plant at Canton, O., is equally applicable to Mine, Mill & Smelter Workers. It is this: A union security clause has no legal effect if the NLRB election authorizing it was held before officers of the parent labor organization signed non-Communist affidavits. Any contract with such a clause cannot stand as a bar to a bargaining election requested by a rival union.

HITS MINE-MILL: For employers having union security agreements with Mine-Mill, it means that any union shop authorization poll the union won between Aug. 8 and Dec. 22 in 1949 was invalid. Therefore, any union security clause negotiated on the basis of such a poll has no legal standing. Aug. 8 is when Mine-Mill officers first signed the Taft-Hartley non-Communist oaths. Dec. 22 the CIO officers complied.

WHAT HAPPENED: Reason for this situation is NLRB's wrong interpretation of what union officers had to sign non-Communist affidavits in order to use Taft-Hartley. Former NLRB General Counsel Robert N. Denham, insisted, correctly, that, for any CIO or AFL union to be in compliance on this point, affidavits had to be filed by Philip Murray, William Green and other CIO and AFL officers. NLRB disagreed, held that only officers of the individual affiliated unions had to take oaths. The AFL complied almost immediately, so its unions are not in difficulty. But the CIO, as such, delayed for more than two years, although most of the unions were in line.

THE IMPACT: As a result, about 4,700 CIO union security clauses signed in the two-year period after Taft-Hartley became law are no good. The unions are moving quickly to remove the union security clauses from the contracts, temporarily, so as to preserve the contracts themselves against enemy raiding. And they are asking NLRB to hold new union-shop polls. How NLRB's ruling will affect certifications and unfair practice complaints issued during the non-compliance period—and complied with by employers—remains to be seen.

FALSE AFFIDAVITS: Hope of Government prosecution of left-wing union leaders who may have lied when they signed non-Communist affidavits faded when Attorney General J. Howard McGrath complained to Congress that Communist union leaders were using this trick to dodge prosecution for perjury: They send a registered letter of resignation to the Communist Party and get back a registered letter of acceptance. He asked Congress to make union leaders swear that they have not been a Communist for at least a year prior to signing the affidavit.

DAILY WORKER: This Communist Party organ applauds Mine-Mill in a feature Sunday magazine article headlined: "The Union They Couldn't Split." Acclaiming Mine-Mill's success in repulsing raids by CIO and AFL unions, the *Daily Worker* says the elections prove it takes more than "redbaiting" to win an election.

UNION LEAFLETS: NLRB upheld Monolith Portland Cement's ban on distribution of union literature inside its plant. In so doing, the Board stressed two basic rules on management's right to restrict union activities on company property: (1) A total ban is unlawful because it interferes unreasonably with union organization. (2) But you prohibit distribution—even during nonworking hours—to keep your plant clean and orderly, if the union has a chance to pass out leaflets elsewhere, such as at the gate or on the parking lot.

PERSONAL NEWS

ARTHUR F. TAGGART

M. D. HASSIALIS

Arthur F. Taggart, long recognized as the dean of the mineral dressing phase of the mining industry, retired in June, 1951, after 32 years of service as professor of mineral engineering at Columbia University, New York, N. Y. He will be succeeded by **M. D. Hassialis,** formerly associate professor in the mineral engineering division.

A native New Yorker, Professor Taggart went West for his training, graduating from Stanford University in 1909. He took a Stanford E. M. in 1910, then spent a year in Bolivia doing geological work. He came to Yale University in 1911 as instructor in the mining department, remaining there until 1919 and rising to the post of assistant professor. He became professor of mineral engineering at Columbia in 1919.

Throughout his career, Professor Taggart has taken an active interest in mining industry affairs. His original work in flotation research set the course, and the pace, for other researchers for years. His *Handbook of Mineral Dressing* is the industry's unquestioned final authority.

His papers, and his lively, incisive comments, have been a major factor in the steady growth of interest among mill men in AIME meetings. His courses in mineral engineering at Columbia are widely known, both for their stiffness and for the high quality of their products. Probably nothing has pleased Professor Taggart so much in years as when a group of his former students gave a dinner in his honor in New York, June 15, and thus gave him a chance to see so many of them again.

Professor Hassialis graduated from Columbia in 1931. He spent the next few years in research for Professor Taggart and in field work, and became lecturer at Columbia in 1937. Since then he has served successively as instructor and assistant professor in the mineral engineering division of Columbia's mining department.

H. H. Kellogg, formerly assistant professor of mineral engineering, has been promoted to associate professor of mineral engineering at Columbia.

Nathaniel Arbiter, formerly metallurgist for Phelps Dodge Corp., Laurel Hill, N. Y., is joining Columbia's mineral engineering staff this summer as associate professor. Both are former students of Professor Taggart's.

Morgan H. Wright, for 33 years manager of the Butte office of Ingersoll-Rand Co., has retired. His residence will be maintained in Butte. He is succeeded by **Robert L. Olund,** previously Ingersoll-Rand's representative in mining districts in the Midwest, Southwest, and California. Mr. Wright is terminating 47 years of mining and business activity. He graduated as a mining engineer from the Michigan College of Mines in 1908. Prominent in his profession in the iron mines of Minnesota, he was in charge of the heavy equipment department in Duluth, Minn., for Ingersoll-Rand before coming to Butte.

Joseph Stephen is now with the U. S. Bureau of Mines at its Duluth office.

F. M. Jardine, who retired last year as concentrator superintendent for Kennecott Copper Corporation, McGill, Nev., is now general superintendent for Round Mountain Gold Dredging Co., Round Mountain, Nev. The company operates a 17,000-ton a day "dry-land" digging and gold washing plant. (See *E. & M J.* June 1950, p. 68.) **T. M. Cahill** is assistant superintendent; **J. C. Perk** is pit superintendent; **Jay Wells,** mill superintendent; **N. D. C. Miller,** chief elec.

Jack V. Everett, Crosby, Minn., engineer with Pickands, Mather & Co. on the Cuyuna range, is now geologist with W. S. Moore Co., of Duluth. For the next few weeks he will be in eastern Canada where the W. S. Moore Co. is doing exploration work.

Directors of Metaline Mining & Leasing Co. elected **Karl W. Jasper,** of Spokane, Wash., president, to succeed **James L. Leonard,** who died in May. **Edward P. Ryan** was named to the vice-presidency vacated by Jasper. **E. K. Barnes** was re-elected secretary-treasurer.

Frank J. Smith, vice-president of Oglebay, Norton & Co., and in charge of the taconite development of Reserve Mining Co. on the eastern Mesabi, has been awarded the honorary degree of Doctor of Engineering by the Michigan College of Mining & Technology.

J. M. Ehrhorn, former superintendent of the U. S. section of the U. S. and Lark Mine, has been named assistant to the manager of USSR&M's western mines, the post held until June by **Mr. Grant.** Ehrhorn is a graduate of Stanford University and has been with the company since 1944. He previously served as superintendent of the Idaho-Maryland Co. mine at Grass Valley, Cal. **John W. Holmes,** until recently acting superintendent of the U. S. and Lark operation, has replaced Ehrhorn as superintendent.

ROY E. SWIFT has joined the faculty of the Department of Mining and Metallurgical Engineering of the University of Kentucky at Lexington. Dr. Swift was formerly on the staff of the Mackay School of Mines of the University of Nevada at Reno.

Carl J. Trauerman, Butte, secretary of the Mining Association of Montana, has been appointed to represent the mining industry by Montana's **Governor John W. Bonner,** on the Montana Small Businessmen's Committee to obtain war contracts and subcontracts.

C. E. Prior, formerly special representative of American Smelting and

Refining Co. in Europe and Africa with headquarters in London, has been transferred to New York as resident engineer. **John J. Collins** has been appointed as Mr. Prior's successor in London. He may now be reached at Adelaide House, King William Street, London, E. C. 4.

J. L. Christian has been elected a vice president of Monsanto Chemical Co. General manager of the company's Phosphate Division since 1948, he came to Monsanto from the Swann Corp. in Alabama.

Marshall L. Havey, having reached retirement age, has resigned as executive vice president of The New Jersey Zinc Co., effective July 31, 1951. Mr. Havey will continue with the company on a part-time basis, on special assignment as assistant to the president.

WALTER H. ALDRIDGE, president of Texas Gulf Sulphur Co. for 32 years, has been elected chairman of the board. Fred M. Nelson, formerly in charge of field operations, is now president. The new executive committee chairman is Thomas S. Lamont. Earl V. Daveler and Lowell C. Wadmond will serve as committee members and company directors.

WALLACE D. BARLOW, formerly a professional staff member of the Interior and Insular Affairs Committee, U. S. Senate, is now an industrial engineer with the Executive Office of the Secretary of the Navy. Mr. Barlow is working in the field of non-ferrous metals and non-metallic minerals for the Office of the Chief of Naval Material, Main Navy Building, 17th and Constitution Ave., N.W., Washington, D. C.

Anthony F. Benson, of Virginia, Minn., has resigned as St. Louis county mine inspector, after many years of faithful service.

The Chamber of Commerce of the United States headed by **A. L. Lynn,** vice president, Island Creek Coal Co., West Va., announced the personnel of its Natural Resources Committee for the coming Chamber year. Minerals and metals will be represented by: **Horace M. Albright,** president, U. S. Potash Co., N. Y.; **Elmer Isern,** president, Eagle-Picher Mining & Smelting Co., Miami, Okla.; **Evan Just,** editor, *Engineering and Mining Journal,* N. Y.; **Frank E. McCaslin,** president, Oregon Portland Cement Co., Portland, Ore.; **Donald H. McLaughlin,** president, Homestake Mining Co., San Francisco; **William Wallace Mein, Jr.,** vice president, Hanna Iron Ore Co., Cleveland.

Joe Bardswich has moved to Estella Mines, Ltd., Kimberly, B.C., where he is mine foreman.

C. S. T. Farish, retired general administrative superintendent of the Cerro de Pasco Corp., Lima, Peru, will be residing for the next several months in the United States. His address is 86 Grant St., Apt. 10, Denver, Colorado, c/o Mrs. Mint Mays.

Robert S. Hewitt is now on the engineering staff of Phelps Dodge Corporation, Morenci, Ariz., where he came following graduation from the New Mexico School of Mines. Mr. Hewitt completed his college course after intervals of service with the Seabees and of work with Cerro de Pasco in Peru.

James N. Sherwin has been elected a vice-president of M. A. Hanna Co. of Cleveland.

Sumner M. Anderson, chief, Latin American Division, Foreign Minerals Region, Bureau of Mines, has been on a five-weeks' survey in Bolivia studying problems relating to Point IV assistance in tin metallurgy.

E. Bruce Hockin, a February graduate of Michigan College of Mining and Technology, is now metallurgist for the Wisconsin Branch of Calumet & Hecla Consolidated Copper Co., Shullsburg, Wis.

Charles A. Mitke is investigating mining properties in Brazil for New York interests.

William A. Newman, formerly in charge of hydraulic mining operations for Pato Consolidated Gold Dredging Ltd. in Colombia, is technical director for Aurifera Asturiana, S.A., a company engaged in developing a large gold and silver property near Navelgas (Tineo), Asturias, Spain.

Lucien Eaton, Jr. is employed by Western-Knapp Engineering Co. at Hibbing, Minn. He was formerly with Aluminum Co. of America.

Correction

On p. 137 of our July issue there was a reference to use of oxygen in smelting, with the suggestion that a satisfactory grade of oxygen might be produced in quantity for as little as 20c. a ton. This statement was in error, a more realistic figure being 20c. to 25c. per 100 lb.

OBITUARIES

Howard N. Eidemiller, Calumet, Mich., who was employed by the Calumet & Hecla Consolidated Copper Co., died at his home on May 14.

Charles Edwin Street, active in the mining field since the 80's, died in Salt Lake City June 8 at the age of 91. He was acting secretary of three mines at the time of his death—the Hampton Mine at Stockton, Utah; the Ely Gibraltar at Ely, Nevada; and the Great Buffalo in Box Elder County, Utah. A native of Ottumwa, Iowa, Street at one time was the owner of the Jupiter mine, a well known property in Park City, Utah, which he sold to the Silver King Coalition Mining Co. He had moved to Park City in 1875, and although residing in Salt Lake City in recent years, was still well known throughout the district.

Ralph Kenyon, former secretary of the Sunshine Mining Company, died in Denver on June 14. He was 76 years old.

Walter Hovey Hill, 82, nationally known Idaho mining engineer and pioneer, died in Grangeville, Idaho, on June 10 following a heart attack. Born in Troy, N. Y., he came to Idaho in 1891 as a surveyor on the Great Northern railroad company's transcontinental line. He took part in the Buffalo Hump gold rush of 1898 and has been active in mining all his life. The American Institute of Mining and Metallurgical Engineers honored Judge Hill by presenting him with a life membership in 1950. He was also a member of the American Society of Civil Engineers and the Idaho and Northwest Mining associations.

THIS MONTH IN MINING

ECA Grants Reynolds Metals Additional Loan To Expand Bauxite Production at Jamaica

The Economic Cooperation Administration announced plans to lend $3,284,000 to Reynolds Jamaica, Ltd., a subsidiary of Reynolds Metals Co., to expand bauxite production in Jamaica, British West Indies.

Under terms of the contract Reynolds will increase bauxite mining and handling capacity from 410,000 tons annually to 750,000 tons. The company will spend an additional $450,000 of its own for the project and the sterling equivalent of $1,250,000. These new funds are in addition to approximately $11 million which ECA loaned to the company in January 1950 to open up the deposits. Expansion plans call for the acquisition of more land (present holdings are 40,000 acres), a 70% increase in mining equipment, added transportation facilities, a new power plant, new roads, an oil pipe line, and construction equipment.

Bauxite produced initially will go to the Hurricane Creek alumina plant in Alabama. Reynolds is also constructing new aluminum reduction facilities in Arkansas, Texas, and Oregon, and it is estimated that these plants will require more than 400,000 additional tons of bauxite from Jamaica. Jamaica bauxite reserves are reported to be the largest in the world, far exceeding those known in the U. S. A.

The new loan will be repaid in aluminum over a period of 11½ years. Under terms of the agreement, the U. S. Government has an option to buy for dollars not less than $750,000 or more than $1,500,000 of aluminum in addition to metal acquired as repayment for the loan.

Iron Ore Tax Take Totals $18,822,661

Iron ore occupation taxes, due by June 14, totaled $18,822,661 and made a new high record, as announced by G. Howard Spaeth. This was an increase of 31.1% over the previous year. Commissioner Spaeth said the increase was due to a greater tonnage mined and to the increased valuation of the ore. Oliver Iron Mining Co.'s share was $12,368,926, the highest state tax in Minnesota ever determined against a single taxpayer.

Workers Call Stoppage A "Fishing Trip"

Michigan and Minnesota iron miners of the Cleveland-Cliffs Iron Co. left their jobs between June 9 and 15 for a "fishing trip." The work stoppage was not called a strike by the union, but was said to be due to dissatisfaction with the method employed on a job evaluation program agreed to in the contract. From a different cause some Pickands, Mather & Co. miners in Michigan were absent from their jobs for two days. Walkouts at the mines of other companies were threatened but were avoided, by agreements on job evaluation.

Freeport Sulphur Co. Buys Virginia Property

Virginia Iron Coal and Coke Co., of Roanoke, Va., has sold its property in Carroll County, Va., to Freeport Sulphur Co. for $1,618,000. The property, containing pyrrhotite deposits, covers about 7,792 acres.

Freeport Sulphur acquired the property to maintain long-term reserves, and does not plan to mine the property at present. The Company reported recently that about 15 projects are now under way in the United States to develop sulphur and iron sulphide ores.

World Diamond Demand Far Exceeds Offerings

According to a Reuters report, the demand for diamonds is several times as large as the quantity offered by the diamond Syndicate. The report continues, "If anything, the market is hardening. On the demand side, it never eased through any repercussions of the American disinflation and down-turn in some other commodities and luxuries." The Syndicate's world sales in 1951 should far exceed the £51 million record for 1950. Although prices were raised 15% in March, the volume of sales has increased.

Colorful forecasts of a "war" between the Williamson interests and the Syndicate, and of a possible loss of millions if Williamson unloads the £500,000 of stones which he is said to have accumulated in London since he stopped selling to the Syndicate a year ago, are regarded as "grotesque." That amount would be less than 1% of the year's total sales. In the present state of the market it could be sold instantly.

Williamson mine joined the Syndicate in 1947 and the contract expires at the end of this year. Dispute with the Syndicate is over what constitutes the "market price" the Syndicate is to pay for the Williamson mines, with Dr. Williamson contending that account should be taken of the higher prices existing in the unofficial market.

Although the contract with Williamson in 1947 granted him a quota of 10% of the world total, it is reported that he never delivered as much as 3% of the world total. Precise size of the pipe reported to be on the Williamson property has never been revealed.

Peruvian Tungsten Mine Gets Export-Import Loan

Export-Import Bank has announced a $650,000 loan to a Peruvian tungsten mining firm for production for the U.S. stockpile. The loan provides that all tungsten produced by the mine between Jan. 1, 1952, and June 30, 1958, will be sold to the United States Emergency Procurement Service. The mine, operated by Fermin Malaga Santolalla e Hijos, has been a steady producer of tungsten.

Tungsten Mining Corp. Will Double Production

Tungsten Mining Corp., one of the nation's largest tungsten producers, operating 16 miles from Henderson, N.C., plans to spend $1¼ million to double the size of its operations. W. L. Long, vice president of the firm, said July 5 that plans call for finishing the new plant within a year. The present operations produce 9,000 tons of ore per month. Annual production of WO_3 is about 60,000 units.

Inco Nickel Production Up 1,000,000 Lb. Per Month

The 1,000,000-lb. monthly increase in the production of refined nickel by Inco, predicted by the end of this year at the company's annual meeting last April, has now been achieved. Dr. John F. Thompson, chairman and president of The International Nickel Company of Canada, Ltd., announced.

This increase in nickel production is a result of the major program of expansion of underground mining capacity, metallurgical process changes and the installation of emergency facilities at Inco's Canadian plants.

Through this augmentation International Nickel's production will be at capacity of 21 million lb. per month—a higher level than in any peace-time year.

Photos from G. M. Wilfley, by Midwest Photo Service, Grand Junction, Colo.

New wrinkles on an old process are at work in Colorado plant of . . .

Climax Uranium Co.

Blair Burwell
General Manager

E. J. Duggan
Vice-President

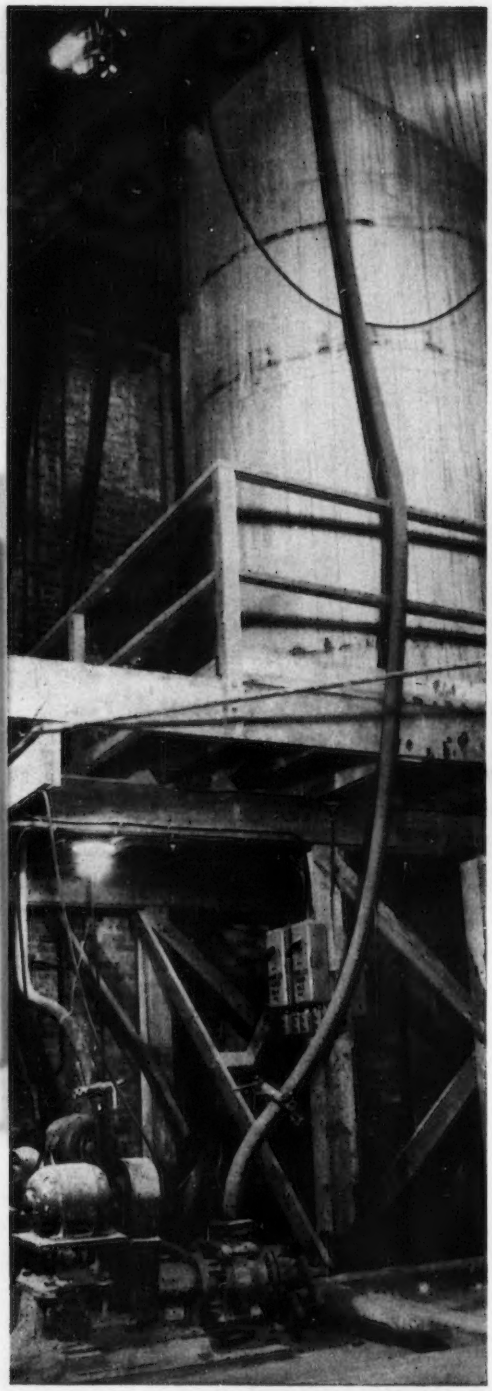
JIM DUGGAN'S wide background of milling experience, much of it at Climax, and Blair Burwell's intimate knowledge of the Colorado Plateau country, its ores, and its people, make an ideal combination to direct this new venture of Climax Uranium Co.

Although the acid-leaching process for carnotite is not new to the area, Climax Uranium has already come up with a new "wrinkle" that makes it easier to handle low-grade ores. This plant will bear watching.

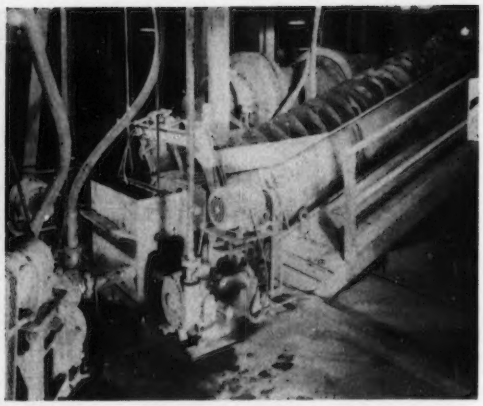
Briefly, their process includes crushing, grinding, sand-slime separation, drying, salt roasting, leaching in water for vanadium, then in hydrochloric acid for uranium. The oxides are recovered by precipitation, melting, and casting. (See also, *E.&M.J.*, March 1951, p. 56.)

(*Continued on next page*)

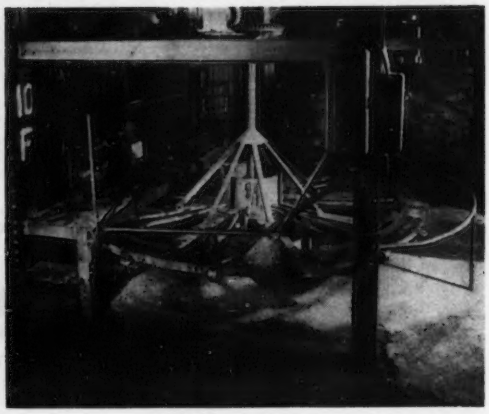
WEIGHING IN ore at Climax Uranium's Grand Junction plant. Company buys small lots, also treats own ores.



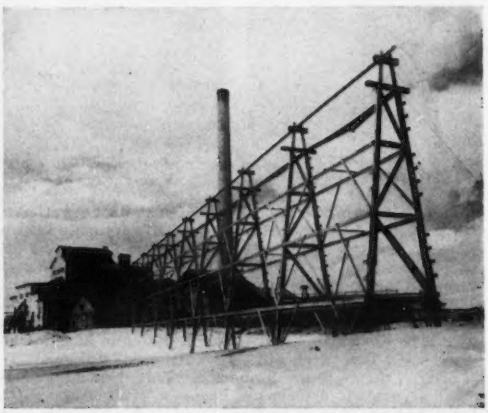
SALT ROAST precedes leaching; these scrubbers recover HCl from roaster gases for use in leaching. Note rubber hose on Wilfley acid pump, used in plant for flexibility.



GRINDING to grain size (48-mesh) uses Marcy-Akins circuit, overflow to Dorr Hydrosizer for sand-slime cut.



VANADIUM CASTING WHEEL, unusual in district, receives pure molten V_2O_5. Broom seems necessary adjunct.



PLENTY OF ROOM on Climax Uranium's new tailing pile. At rate ores are coming in, plant will need all of it.

(*"This Month In Mining" continues on p. 96.*)

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BATTERIES
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They PROVIDE ample power for fast, high-production haulage — more trips per shift, dependable round-the-clock performance, with no end-of-shift slowdown, no unscheduled down time . . . ASSURE inherent safety, with freedom from hazards of fire, fumes, noise . . . SHOW low costs of operation, maintenance, repair, depreciation. SIZES for all makes of battery-powered mine locomotives, trammers, shuttle cars. Call in an Exide representative, and let him prove these facts.

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IN THE UNITED STATES

ARIZONA

★Arizona's mines yielded $201,033,694 worth of copper, gold, silver, lead and zinc during 1950. This was the largest amount since 1918 and retained the state's place as the nation's top copper producer.

Twice before has Arizona topped the $200 million mark. In 1917-18 the yield was greater because of the high prices paid for copper.

Charles H. Dunning, retiring director of the State Department of Mineral Resources, summarized the year's production and reported that Arizona ranked third in zinc, fourth in silver, fifth in lead, and sixth in gold.

The 1950 output was 13% above the $177,894,134 produced in 1949.

Copper production totaled 403,301 tons, largest volume output since 1929. Gold was 118,313 oz.; silver, 5,325,441 oz.; lead, 32,000 tons; and zinc, 60,480. Lead and zinc output were down from previous years.

CALIFORNIA

Mercury miners recondition properties—Central Eureka increases output

★**The Ladd manganese property** in the Tracy area is being operated by Taylor-Knapp Co. with C. P. Knaebel supervisor. The mine will be worked by open-cut methods; operations will be started on the lowest outcrop, with benches carried uphill at about 50-ft. intervals. Output is scheduled for 100 tons per day. Construction of a mill in Tracy was started in January. Emphasis will be on magnetic methods of concentration, but the plant has been designed as a combination mill to use both wet and dry milling techniques. Included in the flow sheet are a jaw crusher, a gyratory crusher, rolls, conveyor belts, double deck screens, diagonal-deck concentrating tables, a dryer and magnetic separators.

Custom ore from nearby mines may be milled at some future date, according to current company plans.

★**A survey of the copper belt** from Newton, Placer County, to Spenceville, Nevada County, is planned by the U.S. Geological Survey. H. C. Miller, director for Region III, U.S. Bureau of Mines, reported recently that a geological survey of the area should be made for possibilities of ore at depth or in lateral extensions before rehabilitation of old properties. The Big Buzzard, Valley View and Dairy Farm were substantial copper producers more than 50 years ago.

★With the **increase in the price of mercury** and hopes that a guaranteed price program may be set up by the Government, mine owners are slowly making plans for reconditioning properties, closed since the end of World War II.

Buckman, Inc., Memphis, Tenn., is preparing the **Dewey mine** near The Geysers, Sonoma County, for large-scale open-pit mining. If development proceeds under present plans, the property is expected to become a stable mining operation regardless of price of mercury.

Diamond drilling, which started in March, picked up ore at a depth of 19 ft. A 4x6-ft. shaft has been sunk on an incline of 32-deg. for a depth of 40 ft. Ore showings were encountered at 29 ft. and have continued to the bottom of the shaft. Hillside cuts have also been made between the Big Red workings and the Eagle Rock workings with ore uncovered intermittently over the half-mile area.

The former Dewey plant with a rotary furnace of 20-ton capacity will be used, while removal of the 50-ton rotary furnace at the Contact mine, also acquired by Buckman, is planned some time in the future.

Another mercury property in Sonoma County is being worked by Carl Baumeister, who is reopening the Oakland workings of the **Culver Baer mine.**

Meanwhile, mercury mining activities are under way at the **Reed property** in Yolo County, where the shaft has been unwatered below the 200 ft. haulage level, and dewatering operations will continue to about the 400 ft. level.

★**Yuba Consolidated Gold Fields Siskiyou Dredge No. 116** completed its operation on the Scott River, bringing to an end dredging in Siskiyou County. This last dredge started operating near the mouth of Wildcat Creek about a mile northwest of Callahan in October, 1936.

★**Central Eureka Mining Co.** reports that ore now comes from the 2,900 ft. to 3,900 ft. levels north of the Old Eureka shaft. After reaching the 3,500 ft. level the ore is trammed to the old Eureka or Central Eureka shafts, which operate to the surface. When development reaches the 4,500 ft. level a drift connecting with the present main shafts will be started. A 3-compartment shaft will move ore directly to the surface, increasing underground capacity to 300-350 tons per day from the present 200 tons.

The company reports the mine appears to have promising long range ore potentials. Years ago, the Central Eureka shaft, with good ore at 4,900 ft., was abandoned because of caving.

★**An eight-inch suction dredge** is being operated by Fred Santoni on the Fresno County side of the San Joaquin River near Lane's bridge. Equipped with pumps, digging bit, riffles and sluice boxes, the dredge rejects rocks larger than 3 in. and gold is recovered by amalgamation.

★**Discovery of a tungsten ore vein** averaging 10 ft. in width, and more than 3,000 ft. in length, has resulted in arrangements for milling 20 tons daily at a custom mill near El Mirage Lake, California. The orebody lies 19 mi. north of Lucerne Valley in the desert area of San Bernardino County.

Samples of the ore find analyzed at the U. S. Vanadium Co. near Bishop, Calif., showed 43.01% WO_3 in the first 80 lb., and a second sample of 960 lb. averaged 4.07%. A third sample of 140 lb. assayed 25.14%, and a fourth sample of 2,000 lb. assayed 1.96%.

The discovery was made by George Hedrick of Hesperia and Leonard Shoush of San Gabriel. Hedrick said the ore apparently lies in a deep vein, being found in quartz, diorite, hornblende and epidote.

COLORADO

Leadville tunnel is now draining mines—Bureau foresees use of low-grade manganese ore

★Gold bricks are now being poured regularly at the **new Carlton gold mill** at Cripple Creek. The first brick weighed 1,208.8 troy oz. Approximately 5,000 tons of gold-bearing ore was treated by the mill to produce the first two bricks of 2,179.6 troy oz. of fine gold.

★The United States has filed suit in the Denver district court against **Big Four Mines, Inc.,** and others for the sum of $350,000. The complaint alleges that from 1938 until 1950 various of the defendants removed ore from the property of the United States to the value of $350,000, and asks judgment for that amount plus interest from the date of the alleged taking of the ores. The complaint further asks for an injunction restraining the defendants from removing additional ore from the property in question. Apparently the motive behind the filing of this suit, say the defendants, is to acquire a clear title to a parcel of land 400 ft. wide extending from the high water line of the Green Mountain Reservoir in Colorado.

(Continued on page 104)

throughout the vast, rich challenging north country

development

FOLLOWS THE DIAMOND DRILLER

He's the first man in. Nothing is proved—no blueprints can be drawn until his findings are in your hands. And that's our job! Year by year, Boyles Bros. drilling crews are opening up the North. Our entire manufacturing and servicing facilities are geared to support these hand-picked teams in every phase of exploratory work. For example:

AT KITIMAT, B.C.

Here, the Canadian Aluminum Company's giant power and smelter project is taking shape. Boyles Bros. crews located the Nechako River damsite and are now engaged in foundation testing for the powerhouse, townsite and the 1½ mile long smelter itself. Other Boyles crews are coring to determine the course of two massive ten mile tunnels connecting Tahtsa Lake and Kemano River. In less than two years' time, a new industrial community will rise where the rods have sunk.

AT RANKIN INLET, N.W.T.

Here, in the sub Arctic at the Northwestern tip of Hudson Bay, another Boyles crew recently began coring for possible new nickel deposits. The men are encountering permafrost conditions up to 500 feet plus considerable transportation and supply difficulties. But no Boyles Bros. contract has ever been halted for want of men, equipment, bits or parts. The experience gained in over 2500 successfully completed contracts is being applied daily to the solution of new drilling problems throughout the North—and throughout the world.

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NEW BOOKS

ENGINEERING AND WESTERN CIVILIZATION. By James Kip Finch. Published by McGraw-Hill Book Co., 330 West 42d St., New York 18, N.Y. Pp. 397. Price $5.

Not only mining and metallurgical engineers, but members of all branches of the engineering profession, as well as historians and laymen, will welcome this book as the first authoritative study of the engineer's contribution to society.

Dean Finch, who teaches a very rare course in the history of engineering at Columbia University, tells a swift and powerful story of the engineer's 50-century struggle to make man the master of his own dwelling place. In a persistent analysis of the relationship between engineering and economics, he builds up perfectly to his major thesis: that there is a delicate balance between technology and democracy which the engineer must study more carefully if either technical or social progress is to be preserved. The last third of the book is devoted to a provocative treatment of the engineer's relations with farmer, worker, capitalist, and government.

The author may be open to criticism for his espousal of the teachings of Lord Keynes and Sir Norman Angell. Nevertheless his main contribution will be acknowledged by all, namely, his strong case for "an engineering interpretation of history." If he does not solve the major problems facing the engineer on the broader human scene, he at least formulates them very well.

WALTER MILLER

Polytechnic Institute of Brooklyn

BOOKS RECEIVED

Mining Year Book, 1951. Complete and up-to-date information on 950 mining companies all over the world, including officers, headquarters, plant installations, production, ore reserves, capital, dividends, and financial position. The Year Book also contains a list of 1,042 managers, engineers, etc.; 11 sketch maps for South African and Australian mining areas, and a buyer's guide listing 589 headings of items supplied by mine machinery equipment houses. Compiled by Walter E. Skinner, 20 Copthall Ave., London E.C. 2. Pp. 574. Price $7, post free abroad.

Year Book for 1950. This book is a "must" in every statistical library. It includes production, imports and exports, and prices of non-ferrous metals. Compiled by the American Bureau of Metal Statistics, 50 Broadway, New York, N.Y. Pp. 112. Price $3.

Principles of Petroleum Geology. By William L. Russell, Associate Professor of Geology, Texas Agricultural and Mechanical College. An advanced textbook which discusses origin and accumulation of oil, important structures, classification of fields, stratigraphy, geophysical exploration and various well-logging techniques. Published by McGraw-Hill Book Co., 330 West 42d St., New York 18, N.Y. Pp. 508. Price $7.

Mining, Metallurgical, Geological, Mineralogical and Petrographical Dictionary in English, Spanish, French, German, and Russian. Prepared by Professor Alexander Novitzky, mining and geological engineer, who has had world-wide experience in his professional field. This practical and useful dictionary lists 18,000 terms in English in alphabetical order. Corresponding equivalents in foreign languages are conveniently published in adjacent tables. For sale at El Ateneo Bookstore, Florida 340-344, Buenos Aires, Argentina. Price 120 Argentine Pesos. Pp. 370.

The Witwatersrand Gold Mines. By Paul Klempner. Statistical information including production, costs, profits, reserves, development work, etc., for major mining companies on the Witwatersrand. Available at Pinners Hall, Austin Friars, London E.C. 2. Includes map. Pp. 307. Price 25s.

The Vaal River Gold Mines. A brief report on mining activities in this area, including pertinent information on Western Reefs Exploration and Development Co., Ltd.; Vaal Reefs Exploration and Mining Co., Ltd.; and Stilfontein Gold Mining Co., Ltd. Includes map of the area. Published by Paul Klempner, Pinners Hall, Austin Friars, London, E.C. 2. Pp. 31. Price 10s. 6d.

Compilation of Field Tests Used in Geochemical Prospecting by the U.S. Geological Survey. Compiled by H. W. Lakin, Hy Almond, and F. N. Ward. Printed by the Northwest Mining Association, West 522 First Ave., Spokane, Wash. The Association printed this compilation for a seminar for geologists conducted by the authors. A limited number of copies (about 150) are still available at the offices of the Northwest Mining Association. Pp. 44. Price 85¢.

Annual Report of the Director of the Mint for the Fiscal Year ended June 30, 1950. This report includes the production of precious metals for the calendar year 1949. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Pp. 126. Price 35¢.

Gas Turbines. By Henry A. Sorensen, Professor of Mechanical Engineering, Institute of Technology, The State College of Washington. Topics covered by this text are: Principles of thermodynamics; simple open-cycle gas turbines; variations of the basic cycle; closed-cycle gas turbines; the axial-flow compressor; centrifugal and positive displacement compressors; axial-flow turbines; combustion systems; structural design; plant performance; and an appendix listing properties of air and combustion gases. Published by The Ronald Press Co., 15 East 26 St., New York 10, N.Y. Pp. 460. Price $6.50.

Washington Impact

(Continued from page 89)

of most of the members of the subcommittee on mining of the House Committee on Interior and Insular Affairs. It was opposed chiefly on the grounds that it provided a major change in handling minerals and should be more carefully considered. The creation of an additional Federal agency was another ground for opposition. Its sponsors were advised to hold formal hearings on their proposal if they want the House to consider it again.

Representative Donovan of New York offered the amendment. He cited the number of Government agencies having a hand in mineral expansion and acquisition and blamed divided authority for the fact that minimum "stockpiles are only one-third complete" after 5 years of purchasing.

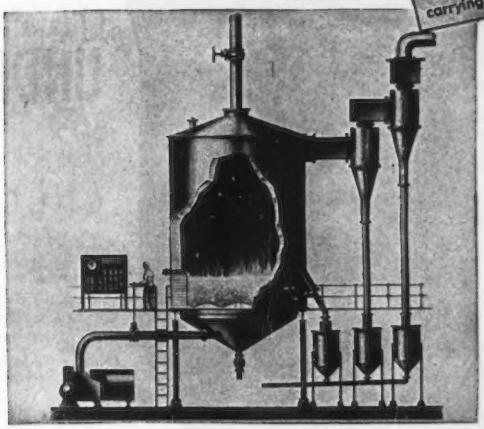
Representative Engle of California told the House he "could literally haul off in a wheelbarrow all of the minerals and metals which have been produced" under the Defense Production Act. He argues for the amendment on the grounds that it simply instructed Chief Mobilizer Charles Wilson to put all of this authority over minerals in one basket.

At least two supporters of the idea —Representatives Budge of Idaho and Bennett of Michigan—specifically stated they hoped the centralized autority would be created by a favorable House vote, and then vested in the existing Defense Minerals Administration. There were other signs that much of the criticism of the minerals program was not aimed at DMA as an operating agency. Most supporters of the amendment, for example, cited the 40 Government agencies which now are involved with minerals expansion or acquisition for the stockpile. Many of these, one way or another, cut across the responsibility which the Defense Act puts on DMA. In most cases, the authority to act alone is specifically denied to DMA.

Can you use

14-15% SO_2 GAS from PYRITE

Dorrco FluoSolids* will produce it . . . at lower investment and operating costs than conventional roasters.


FACTS ON
SO_2 PRODUCTION
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GAS STRENGTH will average 14-15% SO_2 dry basis from pyrite carrying 48-50% sulphur.
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PROCESS SHUT-DOWNS of two or three days present no roasting problem.
COMPLETE INSTRUMENTATION eliminates the personal factor in operation.

● Sulphuric acid manufacturers and all users of sulphur dioxide faced with a shortage of elemental sulphur will find in FluoSolids an economically feasible means of tapping sulphides as an alternate source of SO_2. Utilizing the principle of fluidization, The Dorrco FluoSolids System is a distinct departure from conventional roasters. It brings SO_2 production from those sources down to a reasonable investment and operating cost level.

Its economy, simplicity and ease of operation are indicated by the facts above. For more detailed information write to The Dorr Company, Stamford, Conn., or in Canada, The Dorr Company, 80 Richmond Street West, Toronto 1.

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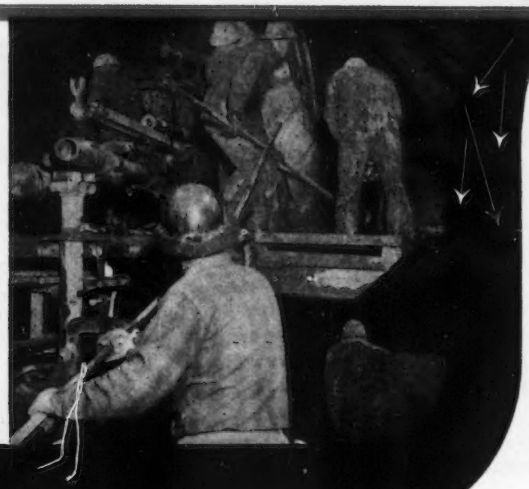
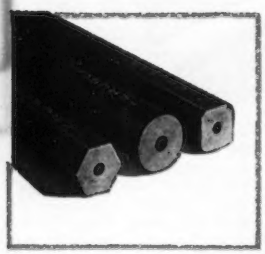


or

UNDERGROUND

it's
CRUCIBLE
HOLLOW
DRILL STEEL
all the way



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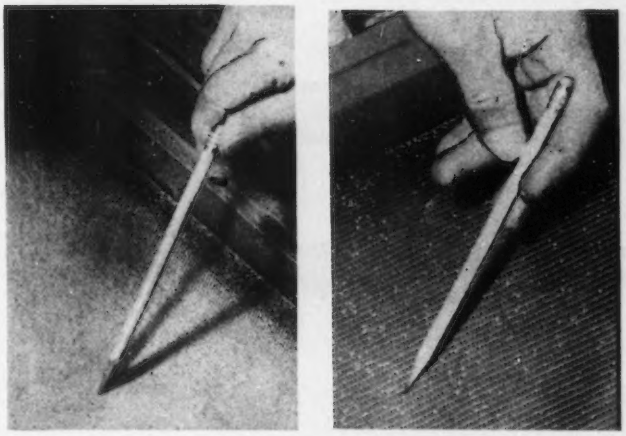
FEATURES

Heated Screen Cloth Helps Stop Blinding

ORIGINALLY DEVELOPED to speed up the screening of moist clay in the manufacture of brick and tile, the Hannon electric screen heater is finding a use in screening other materials in the minerals industries.

It works on woven wire screens 2-mesh and smaller, either old-style gravity screens or modern vibrating types. The difference is shown in the photographs. Two minutes' screening of clay on an unheated screen blinded it. The heated screen (right) was free after an hour's screening of the same clay. All it takes is a transformer, made by F. R. Hannon & Sons, Canton, Ohio. **(1)**

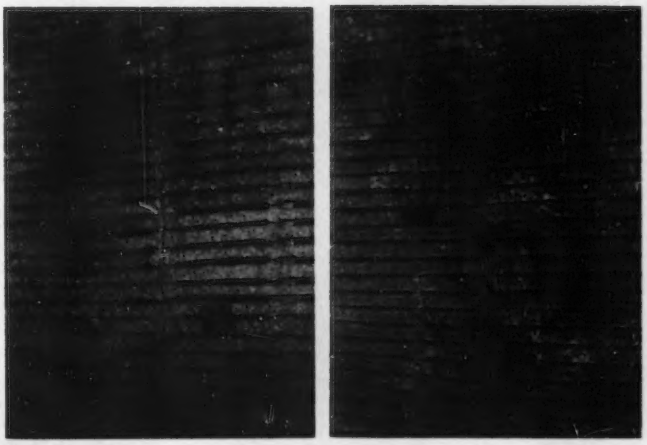


RESISTANCE HEATING makes the difference between the blinded screen cloth on the left (screening clay) and the free and open screen on the right.

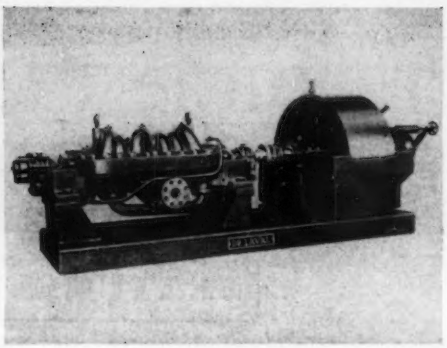
Ductile Iron Grates Have Longer Life

IRON THAT CONTAINS MAGNESIUM, and is therefore ductile, has done a better job in the grates of a Greenawalt sintering machine than gray iron. The photographs show a gray iron grate after one month's service (left); the ductile iron grate at right was still in good shape after one month, and eventually lasted several times as long as the gray iron although subjected to the same service.

Ductile iron shapes are produced by foundries licensed by the International Nickel Co. to use this material. Inco, itself, uses the ductile iron in several applications in the nickel refinery at Port Colborne, Ont. **(3)**

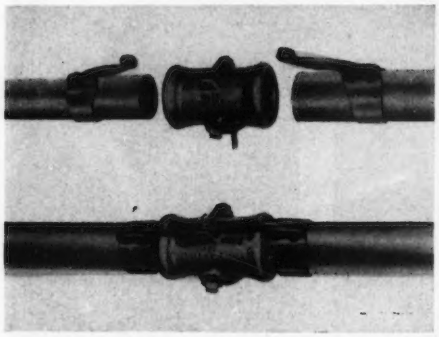


SINTERING GRATES on a Greenawalt machine lasted longer when made out of ductile iron (right) as compared with ordinary gray iron on same job (left).



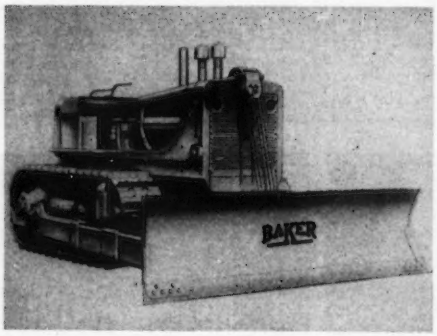
MULTI-STAGE PUMPS. New line of De Laval multi-stage opposed impeller pumps for general medium pressure and temperature service up to 1,000 gpm and 1,200 psi to 350-400 deg. F., for example, mine unwatering. (3)

CHAIN BUCKETS. Specially-reinforced, high-strength chains, sprockets, and buckets feature vastly improved service life over malleable iron types. Bucket shown is cast integral with chain link. Beaumont Birch Co., Philadelphia, Pa. (4)



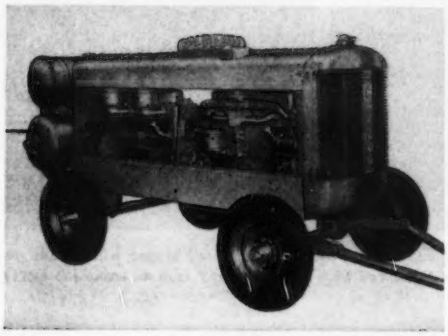
QUICK COUPLER. Wrenches, tongs, and other heavy equipment are said to be obviated with this "Quick-Lok" coupler of R. M. Wade & Co., Portland, Ore. One man can lay as much as 1,000 ft. of pipe an hour. (5)

HANDIE-TALKIE. New version of Motorola Handie-Talkie set with which you can keep in touch with the head office from anywhere in the pit. This one has an "adjustable squelch," said to keep down unwanted noise. Motorola Co., Chicago, Ill. (6)



CABLE-CONTROLS. Redesigned cable-control mountings for a new and larger line of bulldozers, gradebuilders and root rippers that go with the new Allis-Chalmers crawler tractors, yield better visibility, easier maintenance. Baker Mfg. Co., Springfield, Ill. (7)

VERTICAL MOTORS. New Tri-Clad vertical, solid-shaft capacitor motors, used principally for jet pumps and other water-supply jobs out-of-doors where climate is not severe. General Electric Co., Schenectady, N. Y. (8)



PORTABLE COMPRESSOR. Over 90% of the engine parts in this Unistage compressor are interchangeable with the compressor parts. Air delivery is 210 cfm. Schramm, Inc., West Chester, Pa. (9)

SPEED CONTROL. New larger SpeedTrol electric power drives now make variable speed power available up to 20 to 25 hp. Fully variable in speed, unit shown is drip-proof model; Sterling Electric Motors, Los Angeles, Calif. (10)

For Your Files

This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their numbers on card below and mail.

FORK TRUCK. This 8-page descriptive bulletin released by Baker-Raulong Co., Cleveland, O., translates into user benefits, the design and construction features of its FT fork trucks in 3,000 and 4,000 lb. capacity. (47)

CLAMSHELL BUCKETS. Merits of all-welded clamshell buckets are described in an 8-page catalog made available by C. S. Johnson Co., Champaign, Ill. (48)

POTENTIOMETERS. This 36-page job covers ElectroniK electric control potentiometers for both contact and proportional control. Engineering and constructional data, types of control, partial list of available ranges, application data and accessories are described. Catalog 15-15. Minneapolis-Honeywell Regulator Co., Philadelphia, Pa. (49)

CORROSION PROTECTION. "Low Cost Corrosion Protection," published by Permolite, Inc., Hamilton, O., explains Permolite pigmented organic corrosion resistant coatings, their application by brush, spray or dip, air dried or baked. (50)

ROLLER BEARINGS. Fully illustrated and described is the full line of Shafer bearings. Catalog No. 51 also contains complete engineering and load rating data for each, with illustrations of applications. Shafer Bearing Corp., Downers Grove, Ill. (51)

LOCOMOTIVE DRIVES. The reasons the Atlas double reduction spur gear drive for mine locomotives combines power savings with long life are given in a specification sheet just out. Drawings are included. Atlas Car & Mfg. Co., Cleveland, Ohio. (71)

FILTER FABRICS. Actual samples of filter fabrics, six of them, come with this new bulletin on synthetic filter cloths. Has case histories and cost data. Filtration Engineers, Inc., Newark, N. J. (72)

WOVEN-WIRE CONVEYORS. Forty pages of standard and special types of woven-wire conveyor belts and how to use them, practically a handbook. Korb-Pettit Wire Fabrics & Iron Works, Inc., Philadelphia, Pa. (73)

MAGNETIC DRIVES. How to get precision speed control with an adjustable speed magnetic drive on various applications. Would it work on a ball mill? Electric Machinery Mfg. Co., Minneapolis, Minn. (74)

HOW ABOUT THAT? You can get an 8x10-in. glossy photograph of Dagmar, the television star, suitably attired in "welders' garb" (cut way down to there), simply by convincing Eutectic Welding Alloys Corp., Flushing, N. Y., that you have something to do with the welding or metal-working field. (75)

DIESELS UNDERGROUND. Several tunnel and mine production jobs using diesel engines for main haulage underground are described in this bulletin on the Ruth exhaust gas conditioner. The Ruth Co., Denver, Colo. (76)

FLOOR REPAIR. "Over the Rough Spots" conveys the main idea of this booklet that tells you how to protect and repair concrete and wood floors. Stonhard Co., Philadelphia, Pa. (77)

CORE DRILLS. Up-to-date specifications and operating data on lightweight, yet powerful diamond core drills, primarily for work underground. Both electric and air heads described. E. J. Longyear Co., Minneapolis, Minn. (78)

SPLICING ROPE. The long splice for wire ropes, both the simple type and others used by more skilled splicers, are described in this "how-to" booklet. British Ropes, Ltd., Doncaster, England. (79)

PIPE COUPLINGS. Easy to connect but permanent in service, if desired, Naylor Wedge-Lock couplings serve for ventilating, low-pressure, or heavy-duty pipe, 8 to 30-in. diam. Naylor Pipe Co., Chicago, Ill. (80)

WIRE ROPE. Beautifully illustrated booklet called, "The Right Rope for the Job." Shows, by photos and diagrams, how wire rope should be used in all industries, including mining. American Steel Wire Co., Cleveland, Ohio. (81)

WINCH CONTROL. Tells how to get maximum performance and full utility from Hyster D7N towing winch, designed for D7 Caterpillar. Includes: construction details, fundamentals, advanced operation, rigging methods, efficiency tips, and a glossary of terms. Hyster Co., Portland, Ore. (82)

PORTABLE PYROMETERS. Describes two models of a portable pyrometer for taking temperature of molten metals before pouring, galvanizing kettles, etc. Complete specifications. Wheelco Instruments Co., Chicago, Ill. (83)

TRACTOR FLEETS. Assuming you have a job big enough, you'll be interested in this booklet telling how to use fleets of International TD-24 diesel crawler tractors. International Harvester Co., Chicago, Ill. (84)

CABLE EXCAVATORS. This tells you where, when, and how much it will cost, to use the slackline cableway excavator. It digs, conveys, elevates, and automatically dumps. Over 100 photos. Covers every type of surface mining and excavating job. Sauerman Bros., Inc. Chicago, Ill. (85)

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1	8	15	31	38	45	71	78	85
2	9	16	32	39	46	72	79	86
3	10	17	33	40	47	73	80	87
4	11	18	34	41	48	74	81	88
5	12	19	35	42	49	75	82	89
6	13	20	36	43	50	76	83	90
7	14	21	37	44	51	77	84	91

My Name ..... Position .....

Company .....

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AIR HOSE FITTINGS. Gives details on Blue Brute hose fittings of all kinds and sizes. Also a specification sheet on the Blue Brute 2-qt. line oiler. Worthington Pump & Machinery Co., Harrison, N. J. (86)

ROD MILLS. Covers construction, applications, and operating data for rod mills in both wet and dry crushing and grinding. Hardinge Co., York, Pa. (87)

CHAIN DRIVES. How to install, operate, and maintain chain drives and conveyors. It makes a lot of difference if they are put in, and run, properly. Booklet tells how. Chain Belt Co., Milwaukee, Wis. (88)

ROOF INSULATION. How to use Permalite aggregate in concrete as a lightweight insulating roof fill. Has all the data. Great Lakes Carbon Corp., Perlite Div., New York, N. Y. (89)

CRAWLER TRACTORS. Gives detailed specifications on how the TD-9 International crawler tractor develops its 40.5 drawbar hp. Points out job applications. International Harvester Co., Chicago, Ill. (90)

MINE LIGHTING. To show how better mine lighting can be achieved most quickly, G-E has prepared a "Mine Lighting Demonstrator." It's a cardboard box, interior sections of which represent two mine haulageways, one well, and one badly, lighted. Instructions tell how to improve the bad job, by whitening the walls, for example. General Electric Co., Cleveland, Ohio. (91)

Equipment Shorts

SELF-RESCUER. Compact, lightweight breathing mask gives 30-min. protection to wearer against carbon monoxide, long enough to get out. Can be carried or cached in convenient locations. Mine Safety Appliances Co., Pittsburgh, Pa. (31)

WELDER'S WINDOW. A new plastic cover plate for welding helmet windows. More resistant to pitting than glass, won't peel, crack, blister or shrink. American Optical Co., Southbridge, Mass. (32)

SALT DISPENSER. Easy way to pass out salt tablets on hot jobs. Dispenser costs $2.50; tablets are $0.75 per thousand. General Scientific Equipment Co., Philadelphia, Pa. (33)

HIGH-TEMP. ALLOY. New alloy, trade-named Incoloy, with 35% nickel, 20% chromium, 45% iron, is designed for high-temperature, corrosive installations. Saves nickel by replacing former high-nickel alloys. International Nickel Co., New York, N. Y. (34)

CONCRETE VIBRATOR. For compacting freshly-poured concrete and to direct its flow into forms; has air-powered Thor vibrator unit in cylinder 2¾ in. by 17½ in. Independent Pneumatic Tool Co., Aurora, Ill. (35)

LIFT TRUCK. Improved wheel design makes it easier to get around in this new 2-ton fork lift truck. Hyster Co., Portland, Ore. (36)

TRACTOR SALVAGE. Help save copper and tin by salvaging and reconditioning final-drive bellows seals in track-type tractors. Easy to do it; Caterpillar will tell you how. Caterpillar Tractor Co., Peoria, Ill. (37)

HOW LONG? New line of running-time recorders puts down on a chart how long any piece of equipment has been running, and when. Can be made accurate to a few seconds. The Bristol Co., Waterbury, Conn. (38)

MILLER. Simplified axial-face mill, using Kennametal blades, can take off cast iron at from 60 to 70 in. of table travel per min. Mountable on any common spindle. Kennametal Inc., Latrobe, Pa. (39)

DIAMOND BLADES. You can saw a hole in the street, if you need to, with this new diamond blade for Clipper's masonry saw. Cuts concrete at up to 10 in. per min.; asphalt paving at 12 in. per min. Clipper Manufacturing Co., Kansas City, Mo. (40)

BREAKLESS BLADES. You can drop, bend, or twist the new Clipper "break-resistant" abrasive blade, for cutting masonry, or refractories, and it won't break. Clipper Manufacturing Co., Kansas City, Mo. (41)

STARTING DIESELS. Two new air-starting motors for cranking gasoline or diesel engines up to more than 3,500 cu. in. piston displacement. Offer several operating advantages over electrical equipment. Ingersoll-Rand Co., Phillipsburg, N. J. (42)

TRUCK MAINTENANCE. New, heavy-duty universal electric Impactool for tough nut running, as in truck, bus, and heavy industry maintenance. It has a 1-in. sq. driver and is rated for bolts up to 1¼-in. You can handle truck U-bolt nuts without jacking up the truck. Also good for Budd wheelwork. Ingersoll-Rand Co., Phillipsburg, N. J. (43)

CATHODIC PROTECTION. Announcing a service to apply cathodic protection for prevention of corrosion in underground pipelines, tanks, lead-covered cable, etc. Uses soil as electrolyte, impresses current to counteract corrosive chemical action. Harco Corporation, Cleveland, Ohio. (44)

MACHINIST'S VISE. Improved line of malleable iron machinists' vises using a new type graphite-bronze bearing said to permit pulling vise up tighter, holding more securely. Columbian Vise & Mfg. Co., Cleveland, Ohio. (45)

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Memos from the Manufacturers

Mine & Smelter Supply Co. held open house May 12, 1951 at its new branch office and distribution center at 1515 Eleventh St., El Paso, Tex. The new, and larger, location and the thoroughly modern, efficient layout are an indication of the growing importance of mining and industrial activity in the Southwest.

Ottumwa Iron Works, Ottumwa, Iowa, has been dissolved; however, servicing and repair parts for Ottumwa hoists, speed reducers, etc., will be handled by Ted Thoma, P. O. Box 561. Ottumwa, Iowa.

Clifford H. Simmons, president of Universal Die Casting & Mfg. Corp., Saline, Mich., has been elected a director of Crescent Butte Mining & Milling Corp., Gunnison, Colo.

Goodman Manufacturing Co. announces appointment of Robert F. Goudge as a member of their sales staff in the Salt Lake district. Richard Hawkins has been named manager of the foreign department of Goodman, replacing Roy Bigelow, retired.

William J. Fleming has been made manager of the construction equipment sales division of Worthington Pump & Machinery Corp. W. Clifford Mumford has been named manager of the vertical turbine pump sales division, with Fenmore E. Dunn as assistant.

B. F. Goodrich has completed a $5-million industrial belting plant in Akron, said to be the most modern in the world.

Louis Allis Co., Milwaukee, Wis., celebrates this year its 50th anniversary as a producer of electrical equipment, quite a long record of service in view of the comparatively recent widespread use of electricity.

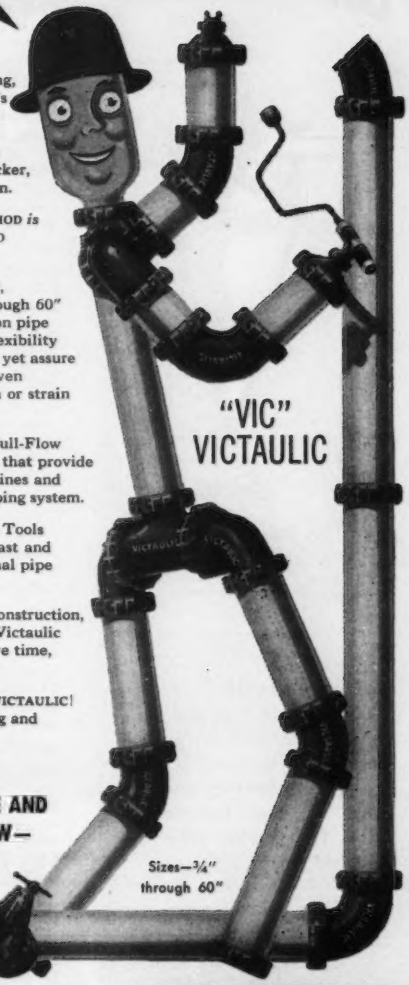
Miller Motor Co., Chicago, Ill., has opened a new plant to increase production of air and fluid cylinders.

L. M. Stauffer has been appointed manager of General Electric Co.'s Rocky Mountain district for G. E.'s apparatus division.

Wheelco Instruments Co., Chicago, Ill., put 11 of its top executives on the road recently, led by Fred Hansen, president, in a show planned to dramatize Wheelco's production job for its field representatives in New York, Chicago, and Denver.

American Wheelabrator & Equipment Corp., Mishawaka, Ind., has named L. L. Andrus executive head of the dust and fume division; John A. Silver, director of sales; E. B. Rich, general sales manager; A. E. Lenhard, advertising and sales promotion manager.

VICTAULIC...
The Best Method for Piping!



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- A complete line of simplified, versatile pipe couplings ¾" through 60" sizes for steel, spiral and cast iron pipe ... that automatically provide flexibility for irregular laying contours and yet assure positive-lock, leak-proof joints even under extreme pressure, vacuum or strain conditions.
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- Handy, portable Vic-Groover Tools that prepare the pipe twice as fast and with half the effort of conventional pipe threader.

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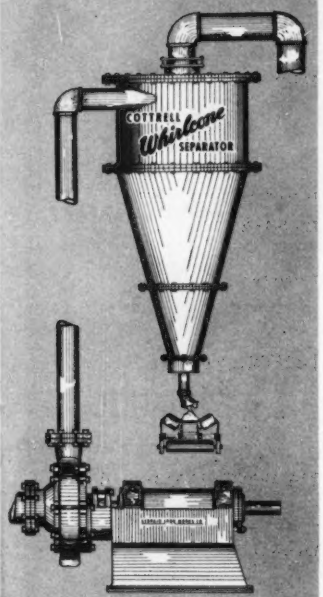

This WHIRLCONE rubber-lined separator is the simplest and most efficient method of separating fines ever invented. Every one sold bears its own testimonial. Write for further information and prices.

The 4" slurry pump pictured is the famous Georgia Iron Works slurry. These pumps are made in sizes from 2" to 14".

GEORGIA IRON WORKS CO.

Marbury Street, Augusta, Ga.

Exclusive U. S. A. Representatives

Colorado *(Continued)*

★**Bill and Leland Sharp** are working on the Chautauqua Extension at Montezuma with hand steel, and have developed some good stoping ground in ore. They expect to install machinery and ship ore this summer. The ore will be milled in Montezuma at the Ulibarri and Jeffrey mill.

★If the Bureau of Mines can find the proper way to **extract manganese from low-grade deposits** in Colorado and Montana, the result will be production of millions of tons of the war-vital metal, according to John East, Jr., regional director for the Bureau, who says: "The Bureau hopes to have all the answers it needs by late summer for extraction from huge reserves in the Leadville and San Juan district in Colorado and near Phillipsburg, Montana." Bureau metallurgists are trying to separate the manganese from iron, lead and zinc impurities. It is estimated that 2 million tons of manganese reserves could be opened at Leadville alone.

★**The Meeker mine** at Central City is now operating. The ore produced runs $60 to $75 per ton. Seven men are now employed.

★Water is flowing from the long flooded Leadville lead and zinc mines at the rate of 3,500,000 gal. a day as a result of its drainage tunnel, the Bureau of Mines reports. The water level is dropping in nearby shafts, making new orebodies accessible. Officials of the **Caldwell Mining Co.** report that the water level in the Hayden shaft has dropped 40 ft. since May 29. In the Little Miami shaft, 1,800 ft. east of the Hayden, the level dropped 18 ft. last week. The drainage tunnel now is past the 9,500-ft. mark of its proposed 17,350-ft. length.

★The chemical plants division of Blaw-Knox Co. has been awarded a $333,870 contract by the Bureau of Mines for **a demonstration-size shale-to-oil processing plant.** The plant will be able to process from 150 to 400 tons of oil shale daily.

★The **new Carlton mill** is now processing 400 to 500 tons of ore daily, according to Howard Keil, mill superintendent. Seventy-five men are employed at the mill at the present time, completing the tailings dam and the construction job inside the building.

★One of the richest gold strikes in the history of the Cripple Creek-Victor gold district has been made **in the Ajax mine** with ore running nearly $80,000 to the ton. The ore was discovered in a pocket in the Bobtail vein, just below the 27th level of the 3,200 ft. deep Ajax, according to Merrill Shoup, president of the Golden Cycle Corp. First shipment of 200 lb. of the ore to Golden Cycle's new Carlton mill ran 2,228.24 oz. of gold to the ton. Further exploitation of the vein is being pushed.

IDAHO

Bradley Co. increases antimony and tungsten output—Calera producing cobalt ore

★**Hecla, Atlas, Newmont and New Jersey Zinc companies** have completed construction of several new mine buildings at the Atlas property near Mullan preliminary to deepening the Atlas shaft to the 2,400 ft. level as part of an estimated $1-million development program. The company's Horseshoe tunnel is being raised and widened and the mine dump raised an additional 3 ft. to place the operation on an even grade for trolley operation.

★**Day Mines, Inc.** has obtained a Government loan of $144,000 from the DMA, representing one-half of an estimated $288,000 deep mine development program centered around the National and Copper King groups of mining claims in the Hunter district northeast of Mullan. The Day company recently acquired the Hunter mine at Mullan and is reported to be dealing for the Pilot group located between the Hunter and Copper King, which would give them the necessary right-of-way to extend the mile-long Hunter crosscut tunnel 10,000 ft. further north to an estimated depth of 3,000 ft. on the King group, which includes the National and Copper King and extends from the town of Burke to the Snowstorm mine northeast of Mullan.

★**Lucky Friday Silver-Lead Mining Co.** has completed its main shaft to the 2,000 ft. level and a 100-ft. sump below the level. Crosscutting south to the two veins exposed on the 1,800 level will be the first development work on the 2,000 level, followed by an extensive prospecting program on this level. The farthest south vein on the 1,800 level contained two 6-in. streaks of ore which gave an average assay value of 77 oz. silver, 38% lead and 10% copper per ton.

★**The Black Horse-Paragon Mining Co.** in the Murray district, recently consolidated by Albert M. Nash, mining engineer, formerly manager of the Hope silver-lead mine at Clarks Fork, has contracted with the Washington Water Power Company for extension of its electric power lines to the mining property. Shoshone County road crews are now replacing destroyed bridges and regrading the road to the mine. Nash contemplates installing a new compressor plant and building a mill to treat old dumps and low-grade ores left in the old mines which could not be profitably handled when the mines were operated. This is in addition to new development work to open the mines at greater depth.

★**Hypotheek Mining Co.** is reopening the old Hypotheek mine, near Kings-

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You don't grease a Gardner-Denver VP4 Sump Pump. Only a *single* kind of lubricant is required. One filling of oil lubricates every moving part — lasts for 24 operating hours — saves your greaser's time — minimizes the chances for lubrication neglect.

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Gardner-Denver VP4 Sump Pump dewatering a tunnel under construction.

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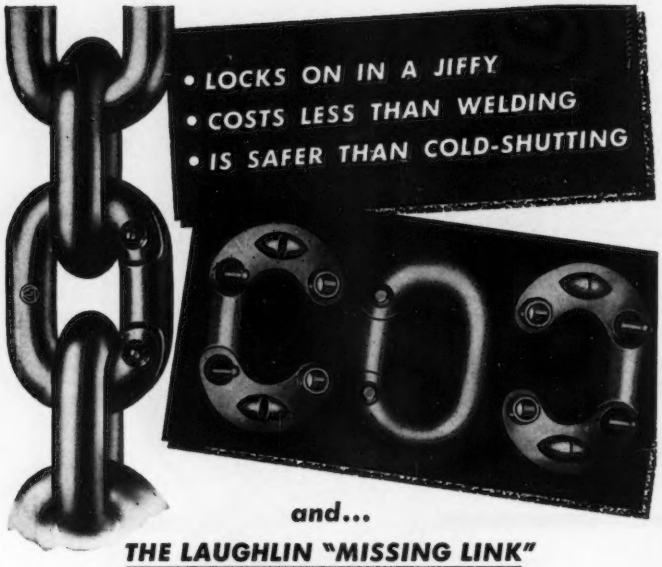

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Idaho *(Continued)*

ton, west of the Bunker Hill, which shipped a large tonnage of lead-silver ore until the vein was cut off by faulting on the lower levels. Recently the company has been revived by Roy H. Kingsbury of Wallace, who has purchased the adjoining King of Pine Creek property. The company has unwatered the old mine, re-equipped it with modern machinery, and has been drifting westerly on the fault, following streaks of drag ore. The company reports that these streaks have now developed a 5-ft. wide vein of milling ore assaying 16% lead, 10½% zinc and 4.2 oz. silver per ton.

★**Bradley Mining Co.** is increasing its tungsten and antimony production to meet industrial and defense requirements, according to J. D. Bradley, co-owner. The company's Ima mine, near Salmon, and its Yellow Pine mine at Stibnite produced 90% of United States tungsten consumption during World War II, and the Yellow Pine mine is now producing around 80% of the U. S. antimony output. The company recently constructed the world's largest and most modern antimony smelter at Stibnite at a cost of $1,500,000 and, in addition to its other holdings, has made a new antimony discovery in glacial gravel and is now treating 100 tons of this material per day in its concentrating plant at Stibnite.

Mr. Bradley reports: "The new smelter can continue operations economically during periods of light antimony demand and yet can supply heavy tonnages of antimony metal or oxides when required. We are stepping up activity at Stibnite to a point where the smelter is now running at a rate to produce 5000 tons of antimony oxide per year."

★**Silver Summit Mining Co.** is drifting westerly on its silver-copper vein after a temporary suspension of new development work, during which time and prior thereto, the vein was opened on the 3,000 ft. level in lens-shaped ore shoots for a distance of 850 ft., after which a winze was sunk to the 3,400 ft. level, showing practically the same conditions. This part of the mine is in steady production. Just recently the company has resumed work in the west drift of the 3,000 ft. level and have so far drifted on high grade silver-copper ore of minable width for a distance of 200 ft. and have about 1,000 ft. to go before entering Purim ground, in which Silver Summit owns a substantial interest, and which shows a promising ore discovery on higher levels.

★**Calera Mining Co.**, (Howe Sound subsidiary) has started producing cobalt-copper-gold concentrates at its Blackbird mine at Forney, southwest of Salmon, Idaho. Cobalt concentrate will be stockpiled, awaiting completion of a cobalt reduction plant which Howe Sound is building at Garfield, Utah. Copper and gold con-

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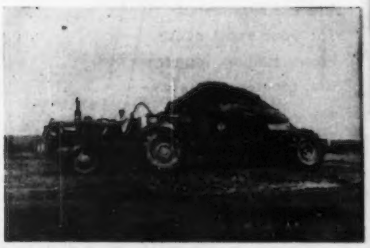
Illustration at left shows a Euclid scraper dumping approximately 20 cu. yds. of fill material at Hickory airport in North Carolina. Powered by a 275 h.p. diesel engine, this scraper has a top speed loaded of 28.2 m.p.h.

Above, a Rear-Dump "Euc" places 22 tons of earth and rock fill during construction of Chief Joseph Dam at Bridgeport, Washington. Other Euclids of this type have capacities of 10 to 34 ton payload, 125 to 400 h.p.



Carrying a heaped load of about 18 cu. yds., this Bottom-Dump hauls overburden at a big open pit bauxite operation in Arkansas. Bottom-Dump "Eucs" are powered by engines of 190 to 300 h.p., have capacities of 13 to 50 cu. yds.

Engineered specifically for heavy off-the-highway hauling, Euclids are standard equipment on many construction and industrial jobs, quarry and open pit mining operations. Combining large capacity and high speed, "Eucs" haul more loads at less cost per load.

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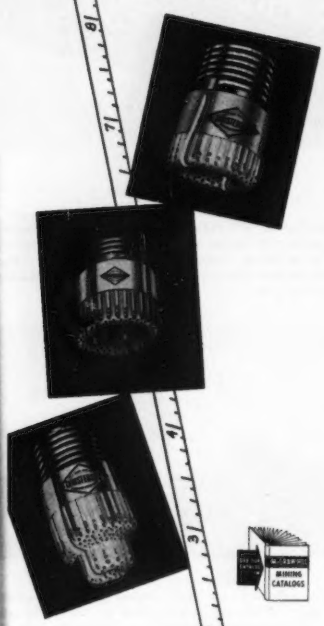

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Idaho *(Continued)*

centrate will be shipped to smelters as produced. The present milling plant at the mine is 600-tons daily capacity. Negotiations are under way whereby the Federal government will help finance expansion of the mill to 1,000 tons daily.

★**Monsanto Chemical Co.** has awarded the Morrison-Knudson Construction Co. a contract to build a $1-million phosphorus plant at Soda Springs, Idaho, to be completed and ready for production in 1952, according to J. L. Christian, general manager of the phosphate division. Location of the plant at Soda Springs follows a 3-yr. investigation of mineral deposits, plant sites, electric power and transportation facilities within the Rocky Mountain area. Monsanto recently purchased 15 phosphate leases in southern Idaho from the J. R. Simplot Co. of Pocatello, covering 4,494 acres, according to the Bureau of Land Management. The company's market will include the munitions industry and fertilizer.

★**Sun Valley Lead-Silver Mines Co.** has just completed a 100-ton flotation milling plant near Hailey and is milling ore from the dump of the old Blue Kitchen mine, operated in the early days on high-grade silver-lead ore.

★A new orebody has been opened in the **Whitedelf mine,** in the hanging wall of the Pearl vein north of the Pugh fault on the main tunnel level, according to Compton I. White, president. The ore is being mined and milled, he said, with concentrates running 62% lead and 30 oz. in silver. Preparations are being made to crosscut to this ore from a winze 400 ft. deeper.

★**Westvaco Chemical Corp.** of New York has in operation an elemental phosphorus plant at Don, 12 miles west of Pocatello. The plant is the first unit in an extensively planned phosphate operation. W. T. Nicholls, Westvaco chemical engineer, says the company's activities have spread over a large part of the country in the last 20 years and states the company now has two plants in New Jersey, two in West Virginia, three in California and one in Wyoming.

MICHIGAN

Cleveland Cliffs prepares new open pit—M. A. Hanna Co. builds pilot plant

★**Calumet & Hecla Consolidated** has reopened No. 1 South Kearsarge mine for the removal of shaft pillars, containing copper, down to the 5th level. The shaft was last in operation in 1920. A small but complete surface installation has been established, including a headframe, electric hoist, and a spur track. Total cost of reopening the property was $50,000.

The company has announced that the operation of the mine will be temporary. Mining should be completed in 6 mo. The company is hiring additional miners.

★**Copper Range** is still awaiting final approval of its application for a Government loan to finance development of its expansive White Pine property in Ontonagon County. As a result of much testing and comprehensive research, a relatively simple flow sheet has been designed to produce a concentrate carrying at least 25% copper and containing 85% of the total copper from ore assaying about 24 lb. of copper per ton.

★**Cliffs Realty Co.** has let a contract for building 100 houses for Cleveland-Cliffs' mine employees of the Ishpeming area.

★**Zontelli Brothers'** Heavy Media and jig plant, located at Pabst "G" shaft, Ironwood, on the Gogebic Range, is in operation. It handles lean ores from the old dumps which accumulated during the years when the "Norrie group" was operated by Oliver Iron Mining Co., ore too lean to be utilized then. Ore from the several old shafts is hauled by trucks to the plant.

★Shipments from the **old Wakefield mine stockpile** are being continued by M. A. Hanna. The ore is hauled for half a mile by trucks to the old Wakefield mine shaft where it is crushed, screened and taken by belt to the shaft pockets for loading cars. About 30 cars are being handled daily.

★**M. A. Hanna Co.** is building a pilot plant at its new Groveland mine, 12 miles north of Iron Mountain, Mich. Drilling in 1948 proved up considerable ore. Tests made at Hanna's Hibbing research laboratory were sufficiently encouraging to warrant putting up the pilot plant.

★After long preparations, the first week of July was one of celebration in the Iron River district, commemorating the 100th anniversary of the discovery of iron ore, at Stambaugh in 1851. An address by Clarance B. Randall, president of Inland Steel Co., marked the concluding day.

★**Cleveland-Cliffs Iron Co.** is preparing to operate a new open-pit mine on the western Marquette range in Baraga County. The mine will cover the old Beaufort-Ohio, Titan and Webster properties, active some years ago as producers of limonite ore. A new road has been made; a 100-ton-per-hour washing plant will be erected. A machine shop and some smaller buildings will also be constructed. About 40 ft. of overburden covers the orebody. The Ohio-Beaufort, idle since 1918, shipped about 828,000 tons while operated by Munro Mining Co. The Webster was opened in 1882 by

TL-1530 Trailer with EUCLID

TRB-15D Trailer with GMC

TP-1114 Trailer with FORD

BD-1118H Body with AUTOCAR

ALL THREE new cement plants chose EASTON SIDE-DUMPS

BP-1114 Body with STERLING

Illustration below shows a double-bottomed EASTON TD-1222H Drop Door Side-Dump Trailer with MACK LR, capacity 45 tons. Investigate these, and other EASTON Side-Dump Trailers and Truck Bodies.

All three of the new cement plants which will operate quarries in the United States (classified as under construction or definitely planned for 1951)*, have chosen EASTON Side-Dumps for quarry haulage.

- **Two of the new plants will use EASTON Model TP-1114 pan type side-dump trailers with Mack LFT's.**
- **One of the new plants will use EASTON Model TL-1015 lift door side-dump trailers with Caterpillar DW-10's.**

EASTON engineers will welcome an opportunity to present, without obligation to you, a thorough survey of your haulage requirements. Start planning now for more efficient quarry transportation by requesting your free copy of EASTON DATAFORM.

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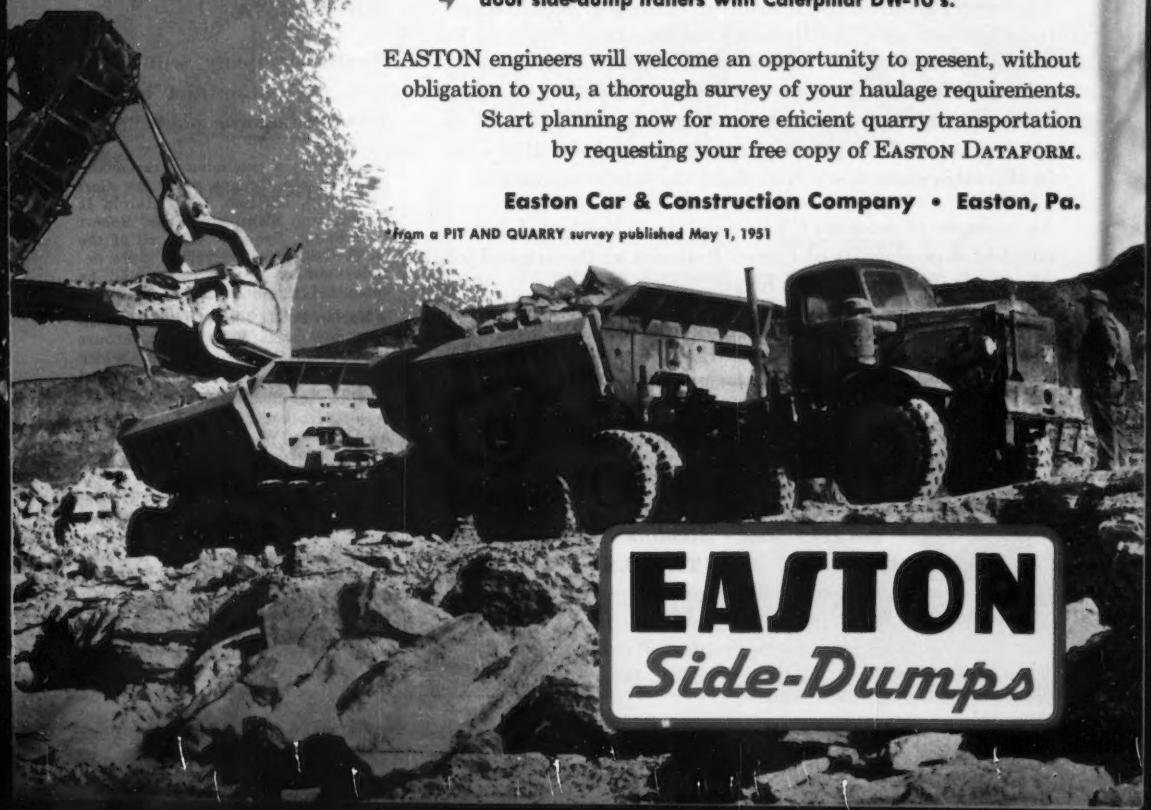
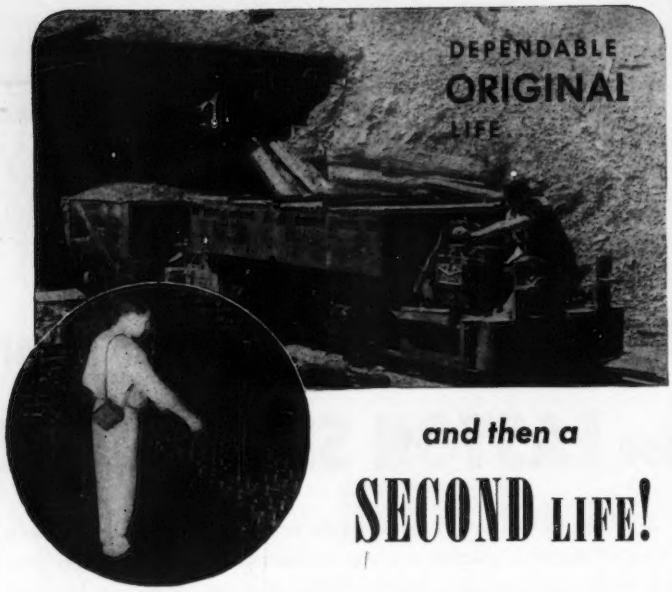
*From a PIT AND QUARRY survey published May 1, 1951





and then a

SECOND LIFE!

MANY MINING ENGINEERS know that steel-built EDISON Nickel-Iron-Alkaline Storage Batteries are exceptionally dependable for rigorous mine haulage duty . . . but others have found they also have a *second* life!

The battery shown above is made up entirely of cells "retired" from locomotives of the Hudson Coal Company, Scranton, Pa. These cells range in age from 17 to 27 years and have served a full life in haulage duty, yet today they deliver 80 per cent of rated capacity. As a standby battery, they operate a bank of circuit breakers and carry emergency lamp loads of over 2800 watts. In effect this protection is free, thanks to EDISON second life.

An example of economy? Yes—and an indication of the unmatched dependability of EDISON Batteries on the original job. *They're built stronger—last longer!*

ADVANTAGES OF EDISON NICKEL-IRON-ALKALINE BATTERIES: They're mechanically durable; electrically foolproof; quickly and easily charged; simple to maintain; not injured by standing idle.

EDISON

Nickel • Iron • Alkaline

STORAGE BATTERIES

EDISON STORAGE BATTERY DIVISION

of Thomas A. Edison, Incorporated, West Orange, N. J.

In Canada: International Equipment Co., Ltd., Montreal and Toronto

Michigan *(Continued)*

Cleveland-Cliffs, shipped about 35,000 tons and closed in 1900. The shipments averaged about 45% iron and 9% silica.

★Because ore boats loaded at Escanaba, Mich., save considerable time in the trip to Lake Michigan or Lake Erie ports by avoiding the Soo locks, an increasing amount of Gogebic range ore is being shipped there instead of to the docks at Ashland, Wis. Last year about 300 boats were loaded at Ashland. Dock officials have been advised to expect only about 120 vessels this season. Although this change of route for Gogebic ore entails a 200-mile railroad haul, the time gained for lake boats is very important when every possible ton of ore is needed by the steel plants.

In this connection it is noted that the first carrier to bring iron ore from Bethlehem Steel Co.'s El Pao property in Venezuela to Sparrows Point, Md., required 13 days for the ocean round trip—somewhat more than twice as long as needed for the average Duluth-Lake Erie ports round trip.

★A fire broke out June 18 in the Cary mine at Hurley, Wis., operated by Pickands, Mather. At the end of the month the 350 employees were still unable to work. The fire, which is 3200 ft. underground, is thought to have been caused by a short circuit in an electric power cable.

MINNESOTA

Hanna company will open new pit — Contract let for Reserve taconite plant

★Following a preliminary reconnaissance of the Cuyuna range by Carl E. Dutton, Madison, Wis., Harold L. James, Iron River, Mich., and Robert G. Schmidt, Spooner, Wis., all of the U. S. Geological Survey, a more detailed survey of the range will be conducted this summer.

★**Marion Power Shovel Co.** has opened a new parts office and warehouse at 2508 First Ave., Hibbing, which will supply the Mesabi range. Richard F. Norris is in charge.

★Northern Pacific-Soo Line ore docks at Superior, Wis., **shipped their millionth ton of iron ore** for the 1951 season on June 21, two and a half weeks earlier than last season.

★**Steep Rock Iron Mines, Ltd.** is well ahead of 1950 shipments for corresponding dates. This season the total should easily surpass the 1,216,614 tons shipped last year.

★McGraw Construction Co., Middletown, Ohio, has received a contract to erect **Reserve Mining Co.'s pilot taconite plant** at Babbitt, Minn., and to install the equipment. The contract

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*From Sharples Amyl Alcohols

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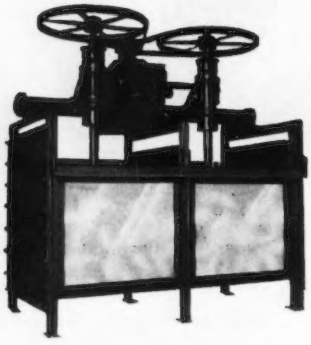

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Minnesota *(Continued)*

was let to Frank J. Smith, of Oglebay Norton & Co., as agents for Reserve.

★**Hanna Coal & Ore Corp.** will start a new open-pit mine, near Keewatin, which will be known as the Carlz mine in honor of the late Carl Zapffe. Northern Pacific Railway Co., for whose iron properties Mr. Zapffe was geologist and manager, has an interest in the fee.

★M. A. Hanna's Douglas washing plant is operating at its new location near the pit. The ore, crushed and screened in the pit, is raised to the washer by a belt. Proximity of plant to pit is being adopted wherever possible.

★Following a plan adopted last year, **Inter-State Iron Co.** (Jones & Laughlin Steel Corp.), has distributed checks to Red Cross, Polio Fund or American Legion Heart Fund in the towns where they operate, from its several mines on the Mesabi. The money represents the savings made by the company's mine safety work.

★Inter-State Iron Co. **began to strip its Pettit mine** near Gilbert this spring. The Pettit adjoins the Schley and the two will be operated as a unit. Archie McWilliams is general pit foreman. The Schley will make its first shipment as an Inter-State open pit producer this season. Its crushing, screening and washing plant is ready for operation. Until the balanced skip hoist is completed in 1952, ore will be hauled to the plant by truck. The Pettit is scheduled to produce its first open pit ore in 1954. Eventually 12 million cu. yd. of stripping will be moved. Stripping is being pushed on a three-shift, six-day basis with a 6-cu. yd. shovel, nine 34-ton dump trucks and three 15-cu. yd. scrapers. The properties were formerly operated by Republic Steel Corp., by underground methods.

★Stripping is again in progress by dragline and conveyor at **M. A. Hanna Co.'s Section 6 mine** on the Cuyuna.

★**The Perry and Wyman pits**, near Keewatin, which M. A. Hanna Co. operates together, provide another instance where the washing plant is near the pit and the ore is raised to it by belt conveyor. A total of 810,320 tons had been shipped from the two up to May 1.

★Wash ore is again being shipped by M. A. Hanna's **Spring Valley mine.** Further stripping is being done.

★**At the Morton mine** (originally worked underground), now being stripped by M. A. Hanna, the top 30 ft. of the circular concrete shaft on the property has been cut off. The shaft was sunk years ago through the sand surface as a drop shaft, using sand hogs and compressed air.

★M. A. Hanna Co. is loading tailings from the **old Rowe mine tailings** basin which were deposited there between

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These are not mere claims but facts substantiated by user acceptance reflecting results. Ask for references and Bulletin 118-A.

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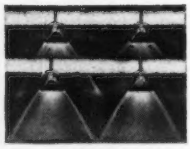

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Minnesota *(Continued)*

1913 and 1920 by Pittsburgh Steel Ore Co. A total of 895,443 tons was shipped. The tailings, loaded by shovel, are hauled by truck to the Portsmouth sinter plant (formerly known as the Evergreen).

★**Old-time employees** of M. A. Hanna and affiliated companies were honored at a dinner held June 14 at the Hibbing Memorial Building. In attendance were: R. W. Whitney, general manager of Minnesota mines; R. C. Fish, general manager of ore mines; and J. H. Thompson, vice-president.

★For the second year in succession the **Embarrass mine**, operated by Pickands, Mather & Co. at Biwabik, on the Mesabi, has been awarded the "Sentinels of Safety" trophy for the best national safety record in 1950. The mine completed 1950 without a single lost-time injury.

★The "Cliffs Victory," Cleveland-Cliffs Iron Co.'s boat, whose capacity was increased by adding a 165-ft. section mid-ship, **is now one of the fastest ore carriers on the Lakes.** She is an oil burner and generates 8500 hp. The boat is 619 ft. long and carries over 13,000 tons of ore. Because of its speed, it will rival the largest boats in season totals.

★**North Hibbing is again on the move.** Many of the houses still remaining are to be moved during the summer. Soon the place will not qualify even as a "ghost town." The only public buildings left are the library and the St. Louis County court-house. Plans are being made to replace these in Hibbing proper.

★A new **34-cu. yd. end-dump Euclid truck** equipped with **two 300-hp. engines** side by side, each with a torque converter and semi-automatic transmission, is being tried out at the South Agnew mine on a test basis. An interesting feature is that the truck came "knocked down" and was erected on the job.

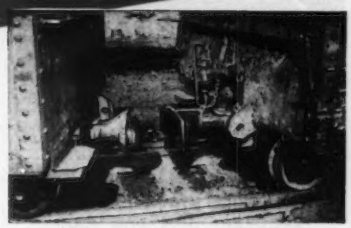
MONTANA

Victor Chemical plant nearly completed—$81-million aluminum works planned

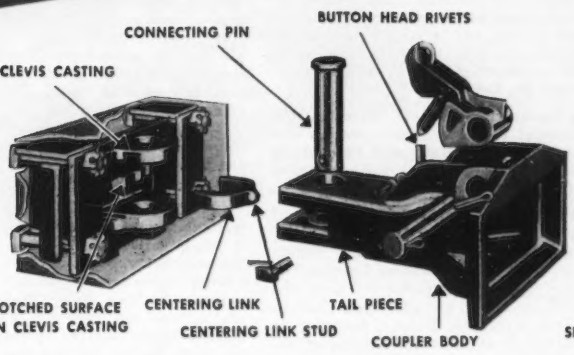
★According to reports from Spokane, the **King of Pine Creek Mining Co.**, Wallace, Idaho, will resume work at its Carbonate mine in the Bald Butte District, near Marysville, Lewis & Clark County.

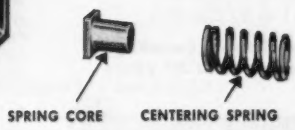
★**Swansea Mines, Inc.**, headed by C. L. Hewitt of Helena, has acquired the Kleinschmidt silver-lead-zinc properties in Lewis & Clark County and expects to move its concentrator, now at its Carbonate-Silver Bell mine in Lewis & Clark County, to the Kleinschmidt property.

Get Speed In Your Haulage With Couplers That —



Automatic Self-Centering keeps these coupler heads in position to join on impact.





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Self-centering O-B Automatic Mine Car Couplers speed up mine car haulage. With old-fashioned couplers a man is needed to guide the heads together, and to make the connection between them. Self-centered couplers come together securely—surely—by themselves.

Parts of the self-centering mechanism are shown in the illustrations here. Rivets passing through the coupler body hold a spring compressed against a spring core. The square core end is recessed to receive a stud on the centering link which bears, at its tips, on a notched surface on the clevis casting. When the coupler tail piece is joined to the clevis by the connecting pin, the link stud presses against the core; depresses the spring. As the coupler head is moved off center, the link rocks on either tip and compresses the spring still further. Thus when the head is released, the link is forced by the spring to pivot about its tip until the head is centered again.

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Montana *(Continued)*

★**C. B. Mitchell**, Placer Hotel, Helena, plans to mine placer gold in Last Chance Gulch at the south corporate city limits of Helena. He proposes to sink a shaft at the narrow part of one gulch and is to pay the city a royalty of 10% on gold recovered.

★**Harvey Machine Co.**, of Torrance, Calif., which is planning to build a large aluminum production works near the Hungry Horse dam, Flathead County, has applied for a license for 5-yr. amortization, amounting to about $81 million, and is said to have placed orders for nearly $30 million worth of construction and electrical equipment for the plant.

★Washington reports indicate that **General Services Administration** will station men at Butte and Philipsburg to negotiate contracts for production of manganese ore.

★**Kootenay Copper Mines, Inc.**, of Kellogg, Idaho, has leased the properties of the Green Mountain Mining Co., near Dixon, Sanders County. The new operator expects to sink the present shaft an additional 100 ft. Steve J. Giulio, Helena, formerly in charge of the mining division of the RFC at Helena, will be in charge of the new work. Green Mountain formerly shipped and milled copper, gold and silver ore with a small amount of platinum.

★**Last Chance Prospectors, Inc.** is offering its services to do preliminary prospecting for any claim owner by the use of bulldozers, trench machines, diamond and churn drilling. The company also is equipped to do annual assessment work on unpatented mining claims. Charles R. Brazier, Box 795, Helena, for many years an officer of the Last Chance Gulch Mining Association, is active head of the company.

★**Montana State College** Engineering Experiment Station, at Bozeman, has been awarded a $11,000 contract by the Army Signal Corps to finance two years' work on developing a commercial process by electro chemistry, for producing battery grade manganese dioxide from Montana ores. The manganese dioxide is expected to be used to make lighter and more powerful dry cell batteries.

NEVADA

Getchell mine treats tungsten ore — $2.5 million plant to process manganese ore

★**The Getchell Mine** in Humboldt County, one of the nation's big gold producers during peace time, has given up gold operations entirely, and has converted its 1,500-ton plant to the treatment of tungsten ores. The ore is being mined from ten deposits in the Getchell district, which are separate from the Getchell gold vein. Ore from the nearby Riley Extension mine, and from another property owned by Don Burgner, of Reno, is also being treated at the Getchell mill.

The plant is at present handling 500 tons daily and efforts are being made to bring it up to full production. The Getchell Co. is installing a compressor at its Granite Creek mine 8 mi. from the mill, and is driving a 2,000-ft. tunnel there. Another compressor and tunnel are being planned at a property 2 mi. from the plant. When these are completed, output of tungsten will be greatly increased, according to Roy Hardy, mining engineer for the company.

During the last war Getchell mine reconverted to tungsten production and ranked fourth in output in the U. S. At present they have a payroll of 125 men.

★Another **major tungsten operation** is being carried out at the Nevada-Massachusetts mine in Pershing County which has stepped up its output to 400 tons daily. Consistently one of the big tungsten producers, Nevada-Massachusetts operated on a big scale during the last war, and is now back on practically the same footing.

★One of the new tungsten developments is that being carried out by the **Canadian-American Tungsten Co.** in Douglas County. The mine is located in the Pine Nut mountains east of Gardnerville, and a large orebody has been blocked out and put under production. To mill the ore the Canadian firm has signed a contract with William Donovan, Silver City mill operator, to convert his plant from a gold processing mill to a tungsten concentrating plant. P. A. Trapp and J. C. Cusack, of Calgary, are the principal backers of the concern, and their property is reported to be shipping a large amount of ore. The Canadian firm has purchased three claims outright and has leased another.

★At Henderson in Clark County, **Manganese, Inc.**, of New York, has launched construction of a $2,500,000 processing plant. Part of the old Hanna plant, which operated during the last war, will be used in the expansion program. The deposit, 7 mi. from the plant, is one of the largest in the nation, and Manganese, Inc., plans to process 1,200 tons daily. H. S. West, president of the firm, says 2,500,000 tons of ore has been drilled, proved and blocked out, and all of the manganese will be sold to the Government for metallurgical uses. A large number of men are now at work on the construction job, which includes kilns for nodulizing and new crushing and grinding equipment. A newly developed flotation process for treating the manganese ores will be used, and 250 men will be employed in the Henderson plant.

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These U. S. Royal Fleetmaster facts add up to *reduced tire costs — increased efficiency — lower maintenance!*

- ★ ***70% Deeper Traction Tread!*** (For complete holding penetration OFF THE ROAD! With long-wearing smoothness on the *highway*)
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- ★ ***Thicker Under-Tread!*** (Your bed-rock for super-traction and mileage)

A phone call does it! **To your nearest U. S. Royal Distributor! He's listed in the Classified Telephone Book!**

UNITED STATES RUBBER COMPANY

Nevada *(Continued)*

★One of the most unusual developments in mining is in progress in Gabbs Valley, Mineral County, where iron is being mined on a large scale for shipment to Japan. During a four-week period in May and June 17,000 tons of the ore was moved out of the mine pits by dump trucks, hauled to Luning, 38 mi. away, where the ore was loaded on railroad cars for shipment to the Far East. **Standard Slag Co.**, owner of the property, is in charge of the open pit mining operations. A total of 200,000 tons has been contracted for by Eisenburg & Co., a Japanese brokerage firm, which is handling negotiations for the Japanese mills.

★At Gabbs, **Basic Refractories Co.** is reactivating its big plant for the production of basic magnesite. The operation is the first new granular magnesia refractories plant to come into production since the start of the national emergency. The plant is located on the site of one of the two largest magnesite deposits in the U.S., about 40 mi. east of Luning in Mineral County. Two mines have been opened by the company and are now in production. The new plant, representing an investment of $2,500,000, is equipped with the world's largest single rotary kiln for "dead burning" magnesia refractories. It is designed to produce 100,000 tons of refractory clinkers per year.

★In Lincoln County, **Combined Metals, Inc.**, has stepped up production of its mine at Caselton. The company is processing 1,000 tons of lead-zinc ore daily. The company has taken over two units at the BMI plant, one for handling lead and another for treating manganese. Combined Metals plans to set up a 150-ton mill to handle tungsten ore, and is operating a big perlite plant. Production from the Combined Metals mine has been continuous since 1923 and the mill has a record of uninterrupted operation since 1941. It is estimated that 1,925,000 tons of ore has been mined since operations began, of which 900,000 tons was treated in the Caselton mill. S. S. Arentz is general superintendent of the Nevada operations.

★**Kennecott Copper Co.**, Nevada's largest mining operation, is now milling nearly 20,000 tons daily at its White Pine County plants, and is preparing to open two additional mines. Work has already been well started on removing 12 million tons of overburden from the new open pit at Kimbley. First ore removal was on November 22, and large tonnages are being mined from it at present. The Isbell Construction Co. has the contract for removing the overburden, and has now completed about two-thirds of the job.

Kennecott also announced a multi-million dollar plan for a deep-shaft mine beneath the present site of the town of Ruth.

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Question: "Who introduced automatic feed control* using mill sound as the control element?"

Answer: "HARDINGE!"

Question: "Who introduced resin-impregnated, water-lubricated main bearings?"

Answer: "HARDINGE!"

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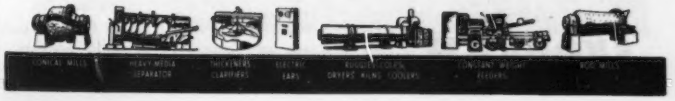

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NEW MEXICO

Pitchblende discovered north of Grants — Gold claims staked near Magdalena

★Sante Fe Railroad mining engineers testing Todilto limestone deposits north of Grants have found mostly low-grade uranium content in the form of tyuyamunite. One test hole provided a high grade sampling of pitchblende. AEC is making laboratory tests.

★Attempting to start work at the Empire Zinc mine at Hanover, Central district, in mid-June brought conflict. The mine had been strike-bound by Local 890 International Union of Mine, Mill and Smelter Workers, who picketed the plant. But Grant County sheriff's forces arrested a dozen pickets on the grounds that they were blocking a public road. District Judge A. W. Marshal announced July 1 that he will make permanent an injunction forbidding strikers to picket the road. When men pickets were arrested, women took over. The judge said that makes them agents of the union. This is the union which was expelled by the CIO a year ago for Red leanings, after a 73-day strike at a Carlsbad potash mine.

★International Minerals & Chemical Corp., potash division, at Carlsbad, is experimenting with automatic doors which divide sections of underground workings. The doors are opened and closed by the motormen operating electric trains.

★A number of claims have recently been filed on mineral properties near Magdalena where William K. Pratt and Associates, Santa Fe, were testing for manganese, and found 15 oz. per ton gold in a 15-mi. strip.

OREGON

Cobalt search intensified — Chrome ore purchase price established

★First ore from the Onion Mountain copper mines west of Grants Pass has been shipped to the American Smelting and Refining Co.'s Tacoma smelter. The property is owned by Strategic Minerals Corp., Ltd., which is also making plans for extensive chrome operations in southern Oregon and northern California. C. E. Smith, manager of the Onion Mountain operation, reports that a high-grade orebody is being developed.

★Mining areas of Grant County, mecca of thousands of gold seekers a century ago, are again being explored, but not for gold. This time it is cobalt that is being sought. The area is being explored and mapped by the United States Geological Survey, which also is inspecting all suspected deposits in the Pacific Northwest. Thus far, only one area—in Idaho—has been found profitable for operations, but A. E. Weissenborn, regional geologist for USGS, has hopes for the Grant County location. Explorations are centering around the old Standard mine near Prairie City, which was opened some 70 years ago for exploration of its copper, gold and silver ores. F. W. Libbey, director of the Oregon State Department of Geology and Mineral Industries, reported that state geologists have investigated the Standard mine and found some radioactive material; "but how much and in what concentration we do not know."

★The Government's program for purchase of chrome ore at the Grants Pass depot will be carried out in a series of spot purchases, the General Services Administration has announced. This means that each delivery will be covered by an offer and acceptance, and will be paid for immediately upon analysis showing that the material delivered complies with the specifications. Purchases will be made at a base price with applicable premiums and penalties, all prices being based on a long dry ton (2240 pounds avoirdupois). The base price will be $115 per long dry ton for lumpy ore and $110 per long dry ton for fines or concentrates. This base price is for material containing 48% Cr_2O_3, and having a chrome to iron ratio of 3 to 1. For material having a chromic oxide content above 48%, a premium of $4 per ton for each additional 1% of chromic oxide content will be paid. For chrome to iron ratio above 3 to 1, $4 per ton will be paid for each 1/10 increase up to 3½ to 1. The penalty for material having a chromic oxide content below 48% is $3 per ton for each 1% of chromic oxide content down to 42%, and the penalty for chrome to iron ratio below 3 to 1 is $3 per ton for each 1/10 decrease down to 2 to 1. The producer must, at his own expense, deliver and unload all chrome at the stockpile site. The Government will pay the cost of weighing, sampling and analyzing.

UTAH

Mining men protest freight boost—Combined Metals to mill New Park ore

★Mining men in the region centering around Utah joined with spokesmen for manufacturing and agricultural interests in sharply protesting a proposed 15% horizontal freight rate boost being pressed by the nation's railroads. A weeklong hearing

on the proposed rate hike was held in Salt Lake City in mid-June by ICC Commissioner William E. Lee.

Walter M. Horne, secretary-manager of the Utah Mining Assn., warned the Commissioner that "unless a healthier ratio between mining costs and metal prices is maintained, mining operations in the West may soon die out. The proposed rate increase will aggravate conditions." He noted that a combination of low metals prices and high operating costs resulted in the closing of 74 non-ferrous mines in the West during the 1949-50 period prior to the resurgence that came as an outgrowth of the Korean war.

Morris Rosenblatt of the Eimco Corp., manufacturers of mining machinery, and president of the Utah Freight Rate Assn., warned that the proposed boost would damage western mining industry, and would not assist railroads measurably, since further traffic losses to truck lines would be the inevitable result.

★**The Utah Tax Commission** in June took formal action fixing the price of iron ore in mines of the state at $4.53 per net ton for property tax valuation purposes. This constituted a boost of fully 275% over the valuation rates set in 1950. The action was taken after hearings at which spokesmen for the Columbia Iron Mining Co., Utah Construction Co., and Colorado Fuel & Iron Co., all operating properties in Utah's southern counties, sought a less drastic approach to the tax evaluation program.

Terming the Tax Commission assessments "discriminatory," company attorneys sought a compromise figure of $3.75 per net ton, as compared to a 1949 evaluation of $1.55. The Commission meanwhile asked an evaluation of nearly $11 per ton.

The Commission chairman, Patrick Healy, Jr., stated the Utah body was "anxious" to arrive at a fair valuation, denying complaints of discrimination. The assessment finally arrived at by the Commission was based, he noted, upon a price for Utah ore set at the figure of Mesabi Range ore, less the transportation charges for bringing the Minnesota ore to Lake Erie. However, the state officials refused to allow a 20% deduction for sales, commissions and shrinkage costs which company spokesmen declared is allowed by Minnesota for tax purposes.

Commissioner Healy stated, "The commission will welcome litigation if companies feel they have been unfairly assessed." He reported the new $4.50 per ton assessment is applicable to ore of 51½% iron content per ton, and added that most Utah ore mined is richer than that, with the per ton value expected to advance accordingly.

The original $11 per ton assessment figure was said to be arrived at through a formula working back from the value of pig iron manufactured from Utah ore.

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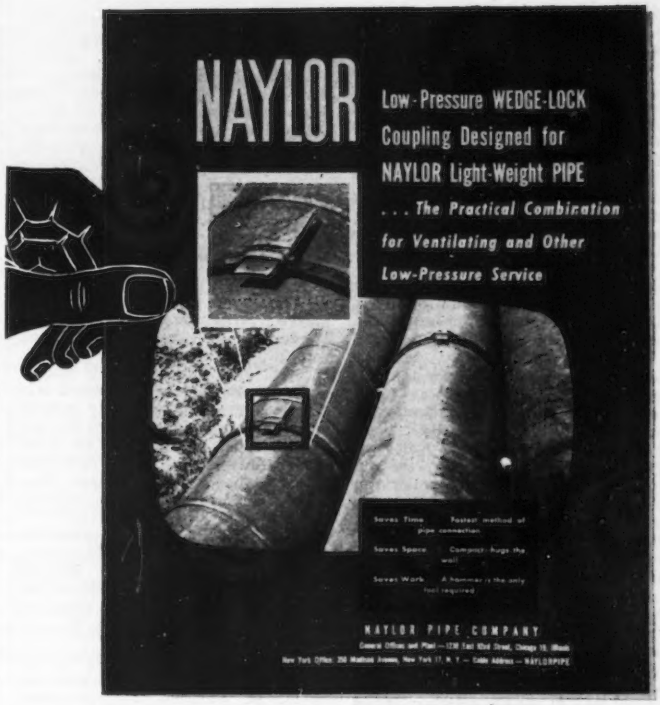
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Utah *(Continued)*

★**American Smelting and Refining Co.'s Garfield smelter** was completely shut down beginning July 2 by a strike of 1,350 CIO United Steelworkers of America production and maintenance employees. The walkout came after sporadic and fruitless negotiations that had begun in February, and after the June 30 expiration of a Steelworkers-AS&R contract.

A shutdown of virtually the entire Utah metals industry having CIO contracts was averted the weekend of June 30 when it was announced that operations would continue under a 30-day extension of previous contracts at United States Smelting, Refining and Mining Co.; Combined Metals Reduction Co.; Park Utah Consolidated Mines Co.; New Park Mining Co.; and Silver King Coalition Mines Co. A time extension for negotiations with Chief Consolidated Mines Co. and Dragon Consolidated Mines Co. was likewise reported.

Meantime, the only portion of Kennecott Copper Corp.'s huge Utah operation in which the Steelworkers hold bargaining rights, the new Garfield electrolytic refinery, continued operating as CIO officials and Kennecott officers agreed to a continuance of contract negotiations until July 31 while a job evaluation program and wage issues are discussed.

However, whether the refinery could continue operation for the full 30-day extension period was problematical by the end of the first week in July, since the struck AS&R smelter at Garfield furnished cathodes for the refinery. Raw ore from the big Bingham pit goes to Kennecott's own Arthur and Magna mills—but must be further processed at the AS&R smelter before moving to the final refining stage at the Kennecott electrolytic installation. There was thus considerable talk immediately after the walkout of the possibility of Federal intervention in the AS&R strike due to the critical copper shortage.

The shutdown at AS&R, if prolonged, could cost the nation fully 24,000 tons of copper monthly, unless Kennecott can find smelters capable of handling its immense output. Of the Kennecott monthly production, 12,000 tons is refined at its own new installation, with an equal amount moving to seaboard refineries.

The wage dispute leading to the strike centers around the CIO Steelworkers' demand for a new base pay scale of $11.30 daily in the smelters—equivalent to the previous rate in mines and mills. The union likewise demands a job evaluation program and "holiday" adjustments.

Staff representative George Haycock of the Steelworkers reported AS&R "made no offer the union could consider" during the prolonged negotiations. Robert D. Bradford, general manager of the Western Department, AS&R, stated: "We have offered them everything they have requested from other operators as far as a job evaluation goes and have agreed to continue negotiations on all other issues. There was no agreement reached on that basis."

★Matching loans for exploration assistance totaled close to a million dollars in Utah by July 1, a study of grants thus far made indicates. **Chief Consolidated Mining Co.** has been granted the largest matching loan for a $463,000 exploration program in the Chief No. 1 mine at Eureka. The Government will put up half the sum and the company the remainder in all such projects approved.

The Chief program calls for funds for pump machinery for dewatering lower levels of the mine, drifting, sinking and raising in exploration for lead-zinc.

Combined Metals Reduction Co. is planning a $222,000 exploration program at its Ben Harrison and Muirbrook mines near Stockton. **New Park Mining Co.** has received approval for a $284,000 project at the Mayflower mine near Park City. **Park Utah Consolidated, Naildriver Mining Co.** and the **East Utah Mining Co.** are numbered among Utah operators who have been reported filing for matching loan funds.

★Federal and mine industry leaders played a large role in the 13th annual **Western States Safety Conference**, held in Salt Lake City June 20-23. S. H. Ash, chief of the safety branch, U. S. Bureau of Mines, reported that "metal mines contain a far greater variety of gases dangerous to life and property than coal mines." He noted that of fifty-seven major mine disasters claiming five or more lives, twenty-five had occurred in non-coal mines.

Walter E. Montgomery, safety director for Kenneth B. S. Robertson, Ltd., discussed "Mining Without Wood in the Asbestos Industry of Quebec." That industry has turned to block-caving in mining with the aid of steel and concrete.

"Safe Blasting Procedures in Underground Metal Mines" was analyzed by J. M. Ehrhorn, superintendent, U. S. and Lark mines, United States Smelting, Refining and Mining Co.

Walter Horne, manager of the Utah Mining Assn., served as chairman for the metal mining safety section, with L. F. Pett, general superintendent of mines, Utah Copper Division, Kennecott Copper Corp., and W. H. H. Cranmer, president and general manager, New Park Mining Co., as program chairmen.

★The U. S. Bureau of Mines has reported that **manganese ores** from two claims in Utah's Beaver County "**have not responded to concentration** by a variety of washing, sizing, gravity, flotation or magnetic separation methods," thereby apparently indicating that hopes held out for major production in the area must be dropped, at least for the present.

The report, prepared by K. C. Dean

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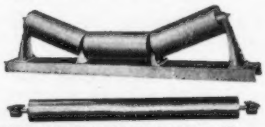

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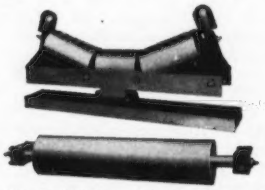

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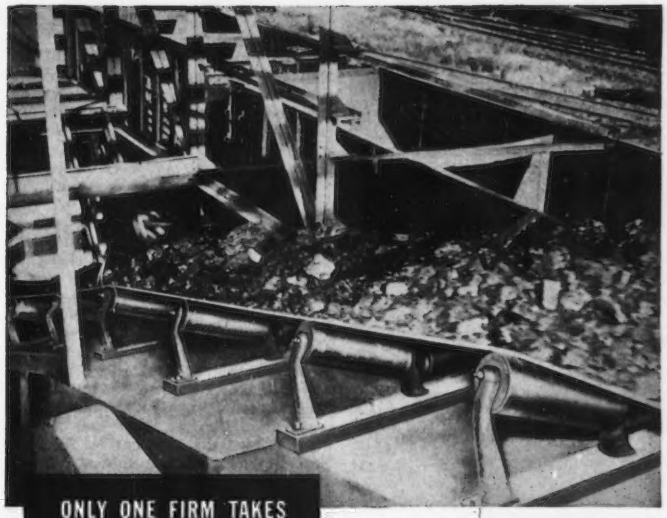

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of the Bureau's metallurgical division in Salt Lake City, concerned ores from the Steelville and Susie Q. claims.

It noted "only 28% of the manganese in the Steelville ore was recovered in a product meeting ferro-grade specifications. Simple attrition grinding, washing and sizing of this ore gave a product that when sintered would assay 35% manganese with a 90% recovery.

"The Susie Q. ore was even more difficult to beneficiate, and it proved impossible to liberate the minerals from each other without losing 60% or more of the manganese in untreatable slimes. The highest grade concentrate made assayed only 14% manganese."

★**New Park Mining Co.** has reported signing a three-year milling contract with **Combined Metals Reduction Co.** for handling of its ore at the CMR mill at Bauer, Utah. The move ended a ten-year period during which New Park's ore had been handled by the United States Smelting, Refining and Mining Co.

New Park officials report that an advantage of the new contract is a provision that the mining company can hold its slab zinc after it is handled by Montana zinc smelters, until such time as there may be a market price rise.

Under the contract reported, Combined Metals Reduction will receive a minimum of 9,000 tons of ore monthly from New Park for the Bauer mill. An additional flotation circuit will be opened at the latter to handle the ore. It is noteworthy that New Park's old minimum with USSR &M called for 6,000 tons monthly. Installation of a new high speed hoist at the Park City mine is expected to boost the monthly New Park output.

Lead concentrates from the Bauer mill go to the nearby Tooele Smelter of the International Smelting and Refining Co. The zinc moves to the Black Eagle Reduction Plant in Montana. The new contract took effect June 1.

WASHINGTON

Kaiser and Reynolds expand aluminum production — DMA loan for tungsten mine

★A $12,789,750 plant expansion program by Kaiser Aluminum & Chemical Corp. at Mead, to increase capacity 20,000 tons annually, was reported recently to have received approval by the Defense Production Administration. DPA announced it had granted Kaiser an 80% amortization certificate for the above amount, which would mean that Kaiser could write off 80% of the expansion cost in five years, for tax purposes. The Kaiser company also announced a $1,158,760 expansion

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Washington *(Continued)*

program at the Trentwood plant increasing production there 25%. In this project it was reported a 60% write-off had been allowed in five years.

★A $12 million expansion program was announced June 27, by Reynolds Metals Co., at its Longview plant. The size of the present pots of the three-pot-line plant will be increased to give an additional production of approximately 40 million lb. annually, according to H. W. Shoemaker, resident manager.

★Kelly Camp mine, 12 mi. north of Republic, in Ferry County, operated by Ole Aavestrud and C. A. Weller, was granted a tungsten exploration loan of $33,000 by the DMA. The advance is repayable from production. Ore is being mined from a surface outcrop by a crew of four. A mill was completed at the property last year. Funds will be used to complete the tunnel started under the surface showing and to increase production. Tungsten concentrate worth $3,500 was shipped to Bishop, Calif., last year.

★Stockholders of **Pend Oreille Mines & Metals Co.** at their annual meeting in Spokane, in June, re-elected Stanly A. Easton and J. B. Haffner, both of Kellogg, Idaho, and Lewis P. Larsen, Jens Jensen, A. W. Witherspoon, and Wray D. Farmin, all of Spokane, directors. Robert E. Sorenson, of Wallace, Idaho, was elected to succeed L. E. Hanley on the board. Mr. Hanley had recently retired because of ill health. Directors then re-elected Easton chairman and Larsen president. Mr. Jensen was elected vice-president and treasurer. He had been secretary-treasurer. A. C. Wimberley, auditor, was elected secretary, and W. L. Zeigler, Metaline Falls, was reappointed general manager. Operating costs of the company for the first quarter were $4.94 per ton, compared with $6.07 during the same period last year. Ore mined during the quarter amounted to 83,859 tons. The total for 1950 was 186,197 tons.

★An explosion underground at the Bonanza lead mine, north of Colville, killed Roy Pelissier and Herman Bruddencamp of Evans. They were working in a crosscut on the 1,300 ft. level. Cause of the blast was unknown.

★The 50-ton zinc-lead flotation pilot mill of Mines Management, Inc., will be constructed a mile and a half north of Northport, under supervision of Frank Paparich, Jr., company superintendent. Mining operations will begin later this year at the company's Advance mine, W. R. Green, president, reported.

★Robert C. Ramser of Spokane, and A. B. Sylvester of Evans, who are leasing the property of **Silver Trail Mining Co.** north of Colville, recently shipped a carload of concentrates to the smelter at Trail, B. C. The ore is trucked 50 miles to the leased mill of Talisman Mining Co. at Laurier, where a zinc concentrate is made running $170 in zinc, and $107 in cadmium, and a lead concentrate which runs $90 in lead and $89 in silver to the ton.

IN ALASKA

According to Roy B. Earling, vice-president and general manager of **U. S. Smelting, Refining & Mining Co.**, the company planned to operate 5 dredges in the Fairbanks district, employing about 350 men, and 3 in the Nome area with about 175 men. Stripping and thawing was also planned in preparation for the 1952 season. It was reported that dredges No. 3 and No. 5 had started operating at Nome in June. Mr. Earling said 2 dredges would operate at Easter Creek, and one at each of the following: Fairbanks, Little Eldorado, and Engineer Creeks. All F. E. dredges will operate 7 days a week, with 3 shifts, at the peak of the season. F. E. Co.'s 12,000-ton Dredge No. 6 is at work on Gold Hill after being transported 1¼ mi. through a hydraulically dug canal from Eva Creek where it operated in 1950.

★**Chuck Herbert**, president of Alaska Mining Association, is operating a copper property at Port Fidalgo, near Valdez.

★**Charles Holky** reported a 17-man crew carrying on dredging operations at Innoko on Gaines Creek in the Ophir district.

★**Candle Creek Mining Co.** is operating two dredges on lower and upper Candle Creeks but will not operate the Mud Creek dredge this year, according to Jack Allen of Los Angeles, who took over the Havenstrite Mining Co.

IN CANADA

Lead-zinc find spurs rush in Quebec — Inco drilling in Shebandowan area

BRITISH COLUMBIA

★Rising costs in British Columbia's mining industry are indicated by the 17.5c.-per-hr. wage boost awarded 5,000 employees of **Consolidated Mining & Smelting Co.** at Trail, Kimberly and Calgary. The wage boost, announced jointly by Cominco and Local 480, Mine, Mill and Smelter Workers' Union, is in addition to a 7c. interim increase granted by the company last December. It brings the basic rate of pay for laborers to $1.38 per hour, and

for tradesmen to $1.83 per hour. The agreement also provides three weeks' vacation with pay after 20 years' service.

★**Five gold mines in British Columbia** are expected to benefit from increased financial aid under a bill passed by the Dominion parliament providing for a revised formula for payments under the Emergency Gold Mining Assistance Act. The five mines, which will receive an additional $71,000 on the basis of last year's production, are Bralorne, Cariboo Gold Quartz, Island Mountain, Kelowna Exploration and Pioneer. The new bill, an amendment to the Emergency Act, gives the mines the option of using 1948, 1949 or 1950 as their base year for computing cost aid and provides the B. C. mines with payments on 103,250 assistance ounces, compared with 99,086 last year, an estimated increase of 4.2%.

★Improved prices and demand **have spurred a prospecting rush for asbestos** in British Columbia, with prospectors going back over old showings which were passed up when prices were low and supplies ample. Scouts from big producers in eastern Canada, U. S. and Australia have been visiting Vancouver to line up new B. C. sources. Potential deposits are known in many areas, including Bridge River, Tulameen and Hope areas, at several points in the northern Atlin area and near Dawson. A major discovery has been developed in the McDame Creek area close to the Yukon border in the past year. Asbestos Corp., Ltd., and Conwest Exploration are diamond drilling there. Transcontinental Resources is developing a deposit at Sproat Mountain, north of Arrowhead.

★Suggestion from provincial mines department officials at Victoria that **increased immigration of miners from Europe** might be undertaken to meet a growing shortage of miners in British Columbia, has brought a declaration from the Mine-Mill union that British Columbia won't have to worry about a shortage of workers as long as the present high scale of wages ($2 a day above those paid Ontario metal miners) is maintained.

★**Gibson Girl Mines, Ltd.** (NPL) has been incorporated to acquire and develop the Gibson Girl group of base metal claims on Gibson Island, 27 mi. south of Prince Rupert. Head of the new company is Karl J. Springer. Capitalization is 3,500,000 shares of $1 par value, with 400,000 being held by Helicopter Explorations Ltd., 600,000 underwritten for development, and 1,000,000 under option to the Springer financing group.

★**Dumac Mines Ltd.** is assuming management and technical control of the White Hope silver-lead-zinc property of Craigmont Mines Ltd. on Slocan Lake, and technical control of Montrose Mines & Metals Ltd., which owns the Marion claim close to New Denver. The White Hope has been worked on lease during the winter and ship-

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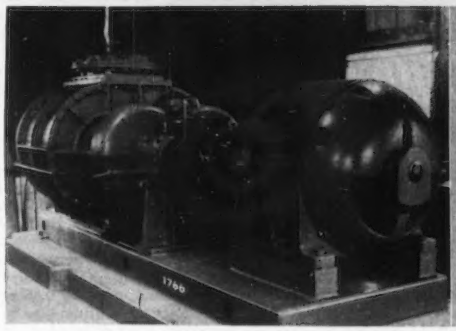

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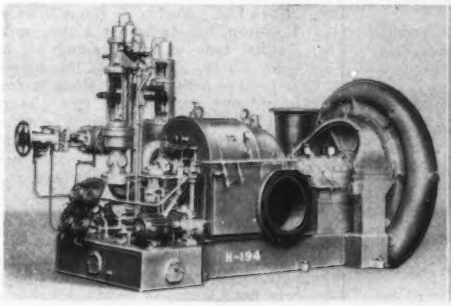

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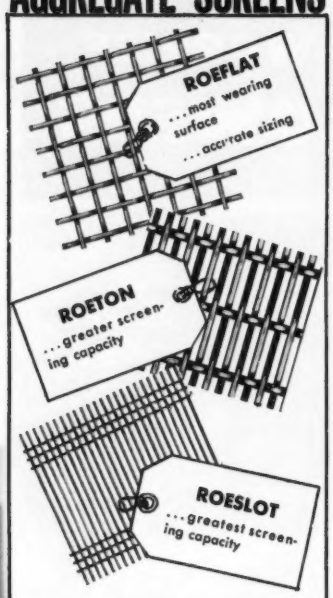

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ROEBLING

British Columbia *(Continued)*

ments to Trail had a gross value of about $140 per ton. One sample gave 2.6 oz. silver, 10.4% lead and 34.2% zinc.

★**Base Metals Mining Corp.'s** new mill at Cork Province mine in the Slocan is now in full operation with regular shipments to smelter, and ore grade shows steady improvement with an average of 4% lead, 7% zinc, 4 oz. silver and some cadmium. The Vancouver Island Base Metals 150-ton mill at the Twin J mine is reaching capacity production after swinging into operation in May, and good grade zinc ore has been opened in working from the Tyee section of the mine into the old Richard III section.

★Two new orebodies have been opened since January at the **Cariboo Gold Quartz** property near Quesnel. Eighty feet of ore grading 0.51 oz. gold per ton has been opened in the Rainbow section, and on the 2,100-level a vein, identified as a downward persistence of an orebody opened on the 2,000-level, has been found, grading 0.35 oz. gold per ton. Rate of milling was increased from 160 tons daily in January to 197 tons in April.

★Mining development is in full swing in the Smithers and Hazelton camps. **Cronin Babine Mines, Ltd.**, reports shipments to the Trail smelter from the Cronin mine near Smithers brought a gross value of $134.51 per ton. Mill construction is continuing. A contract has been awarded to Wright Engineers Ltd., metallurgists, to take charge of design and supervision of mill installation.

★Silver Standard Mines Ltd. produced gold, silver, lead, zinc and cadmium worth $1,901,224 or $90.36 per ton from 21,041 tons milled in the year ended March 31. Net profit was $777,898, or $36.97 per ton. Cost of mining was $13.50 per ton. Mill heads averaged $135.60 per ton in June.

★Work at **Western Uranium Cobalt Mines Ltd.'s Rocher de Boule mine,** at Hazelton, has indicated a reserve of 200,000 tons of ore grading 0.4 oz. gold, 4.0 oz. silver and 4.1% copper. A reserve adequate for close to four years' operation of the new 150-ton mill had been found in No. 2 vein, following driving of three raises and unwatering of the winze. Work is also in progress on No. 4 vein, where most of previous production originated.

★**Quatsino Copper Gold Mines Ltd.** reports further diamond drilling confirms substantial widths of 55% magnetite iron ore on the company's property near Quatsino Sound, Vancouver Island.

QUEBEC

★**Sigma Mines,** Dome-controlled gold producer in the Bourlamaque area, expects to have its main shaft deepened to the 3,000-ft. horizon by the end of the year, a development that will take care of mining requirements for some years to come. Only about 1% of Sigma's ore to date has come from below the 10th level at 1,225 ft., and 70% of the mine's proven 1.4 million tons of ore is above that horizon.

The deepening will permit establishment of seven new levels, but little work will be done on them for some time. Present bottom working level is the 16th, at 1,975 ft., but much development remains to be done between the 10th and 16th.

In the meantime gold production continues steady, the mill treating 1,150 tons per day for a total output of $1.1 million from 172,863 tons in the first five months of 1951.

★**A mildly exciting staking rush** has developed in the north sections of Destor and Duparquet townships, about 25 miles north of Noranda, following a lead-zinc discovery by the J. J. Coghlan interests. The original discovery has been incorporated as Parquet Mines, which plans extensive drilling. Subsequent staking by others has extended over a length of 15 miles.

★Another 10,000 ft. of diamond drilling from surface has been started by **Lake Dufault Mines** on its property adjoining Waite Amulet in the Noranda area. A number of deep holes will be put down to test a favorable structure lying southeast of the No. 2 zinc deposit. Its minimum depth is 1,900 ft. below surface.

★Preparations for mill construction are going ahead on schedule at the Louvicourt property of **Bevcourt Gold Mines,** for which the mill of neighboring Perron Gold Mines is being purchased. The actual job of plant moving will start later in the year, and in the meantime Perron is still treating Bevcourt ore on a custom basis.

NEWFOUNDLAND

★Surface drilling is in progress at the **Notre Dame Bay property** of Pilley's Island Copper-Pyrite Ltd., the exploration venture being jointly sponsored by Frobisher Ltd. and Halcrow Swayze Mining Co. Idle for a long time, the ground was the scene of extensive exploration many years ago, and interest has been revived by current high metal prices.

ONTARIO

★**Kirkland Lake Gold Mining Co.** opened up almost twice as much new ore in the first five months of 1951 as in all of 1950. Drifting disclosed 2,230 ft. averaging $20.40 across a width of 3.0 ft., compared with 1,257 ft. in all of 1950 and 2,763 ft. in 1949. Feature of this year's work has been the discovery of No. 9 vein on the 5,600 ft. level. Farther south than any pre-

viously known ore, the vein has been opened for more than 500 ft. with no limits reached in any direction.

★**McIntyre Porcupine Mines** continues to build up its investment portfolio, and at the end of its 1951 fiscal year held securities with market valuation of $31.1 million. The company's investments include $6.3 million in government bonds, 50,000 shares of Amerada Petroleum, 10,000 American Metal, 100,000 International Nickel, 57,480 Bell Telephone, 40,700 Standard Oil of New Jersey, and a number of others of similar quality.

★Gold production of **Delnite Mines** in Porcupine has been running well above that of last year; $689,802 from an average of 433 tons milled daily in the first five months versus $605,749 from 410 tons per day last year. Profits are running behind the 1950 pace, however, due to rising costs. The mine is having an excellent development year. In the first five months new ore disclosed in drifting was almost double the amount marked up for the corresponding period of 1950.

★Canada's leading gold mine is keeping well out in front. **Kerr-Addison** reports that the results of first work on the deepest level (2,650 ft.) are right up to expectations. It is possible that the two main orebodies, No. 6 and No. 21, may be better than ever at this horizon.

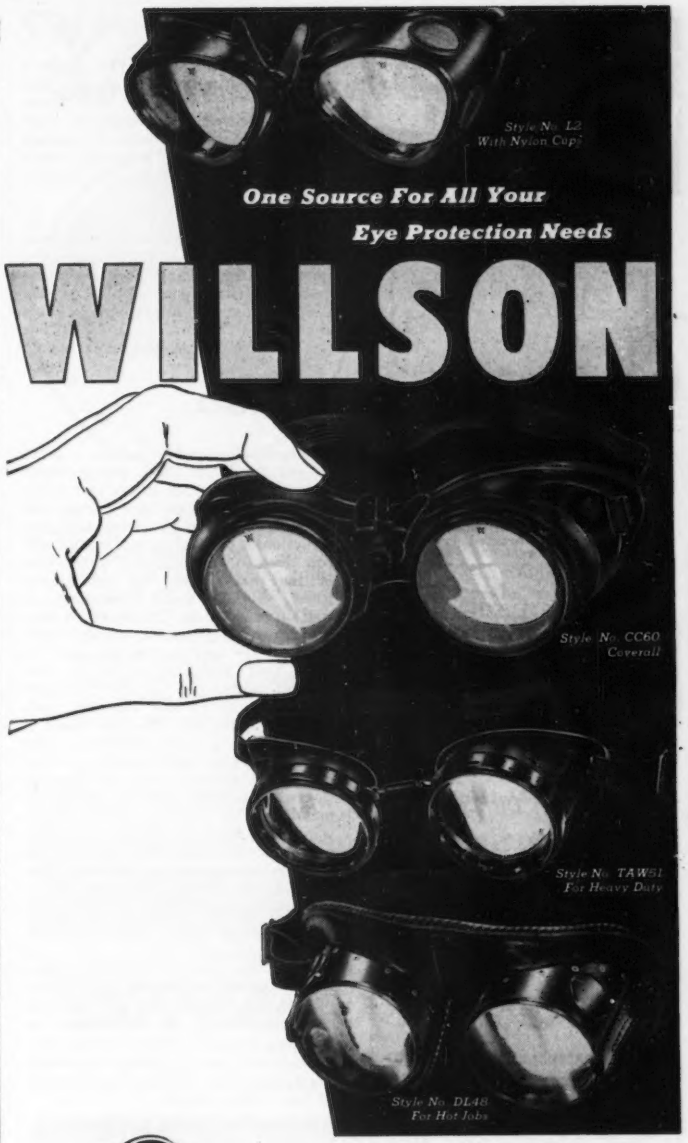
The 2,500-ft. level was drilled off several years ago, showing 11,000 tons per vertical ft. averaging 0.24 oz. gold per ton. Subsequent work has been confined to shallower horizons, with results that have established the mine as one of the largest. This year, however, development has been started in earnest at depth, and its progress will have substantial significance.

★As part of its stepped-up program of exploration, **International Nickel Company of Canada** has resumed drilling on its holdings in the Shebandowan area, 60 miles west of Port Arthur. Little work has been done there since the mid-thirties when Inco purchased the ground for $250,000 cash.

The extensive drilling done at that time indicated approximately 1 million tons of ore averaging about 2% nickel. It is hoped that this can be expanded to a size that would justify production expenditures.

★**Paymaster Consolidated Mines** has started a depth development and expansion program to bring into the production the high grade porphyry orebodies discovered on the mine's lowest level (4,075 ft.) during the past year. The main shaft will be deepened from 2,575 to 4,075 ft., a job that will last well into 1952. When the new ore is available for milling, probably some time in 1953, mill capacity will be enlarged from 600 to 800 tons daily.

★**The deepest diamond-drill hole** ever put down in Canada has proved the depth extension of Algoma Ore Property's Helen iron mine in the Michi-



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Ontario *(Continued)*

picoten area to 5,380 ft. This depth is considerably more than double any previously proven depth. The intersection showed ore similar to that being mined in the relatively shallow workings above, and indicates a substantial extension of the mine's probable life.

★Five stations have been cut by **Upper Canada Mines** in the deepening of the No. 1 shaft at the Larder Lake gold mine. Establishment of eight new levels will be made possible by the deepening, which is carrying the shaft from 1,750 ft. down to 2,750 ft. The job should be completed by early fall.

MANITOBA

★**Sherritt Gordon Mines, Ltd.,** expects to get its Lynn Lake nickel-copper mine into production in the last quarter of 1953. The railway survey has reached the Churchill River and construction is to start soon. Its cost will run close to $15 million. Construction of the power plant on the Laurie River, 40 miles from Lynn Lake, is well up to schedule. Turbines and generators are expected to be delivered next winter and to be installed by June, 1952. Foundations for the permanent mining plant at the "A" shaft are being poured and steelwork will be erected this fall. The "A" shaft is being deepened 600 ft. below the 1,000 ft. level. When shaft sinking is completed, all attention will be directed towards the completion of the development of "A" orebody for mining. It is planned to draw ore from only the "A" and "E" orebodies for the first 5 years of production. Initial Lynn Lake output is expected to be worth $14 million a year from the start.

★**Lee Gordon Mines** reports a new surface showing 1,000 ft. south and west of the island on Vamp Lake where previous drilling secured values in gold and copper. This new showing on the mainland was not included in the area recently covered by an electromagnetic survey. Canus Petroleum Corp. holds 52% of the issued shares of Lee Gordon Mines.

★**Hudson Bay Mining & Smelting Co.** is doing extensive exploratory work on claims held at Nickel Lake, near Fort Francis, Ontario.

YUKON

★Marc Boyer, Deputy Minister of the Department of Mines & Techinical Surveys, reported that the Mayo and other districts of the Yukon will be mapped by field parties using helicopters, at a cost of probably $100,000.

★Gross production in the Territory last year amounted to $6½ million. Interest has been great enough in the Territory so the Government is cooperating in constructing a **year-round highway** 220 miles from Mayo to Whitehorse, and also surveying for hydro-electric development on the Mayo River. An initial appropriation of $500,000 has been made toward a $3 million development of between 6,000 and 8,000 h.p.

★A large supply of **high grade iron ore** has recently been discovered in the Mayo district in the Yukon. According to Dr. H. S. Bostock, Department of Mines official of Canada, the lengthy deposits show outcroppings, and it is believed open-cut methods can be used for the mining.

★**The Department of Resources and Development** at Ottawa reported total value of gold production was estimated at $3,832,720 in the Yukon for 1950, accounted for chiefly by placer operations. Production of silver-lead-zinc-cadmium was estimated at $5,454,650 for 1950.

IN MEXICO

Move for minting gold is seen—Sulphur production starts at Poza Rica

★**Mexico has no silver (as straight silver) for export** because all of the 1951 production, estimated to be from 35 to 40 million oz., will be required for minting money for Mexico and other countries, such as Saudi Arabia, according to Carlos Novoa, Director General, Bank of Mexico. Mexico will mint 76,400,000 pesos in 5-peso, half-peso, and quarter-peso pieces for her own use during the last half of 1951.

Rodrigio Gomez, sub-director of the Bank, back from Saudi Arabia, announced that under a pact made in Washington, 30 million Riyial (Arabian monetary unit) have been delivered in installments of 10 million each, and 20 million more are being minted. Mexico is also considering minting silver money for Western Germany and Pakistan. The Bank hails these transactions as a boon to silver mining in Mexico.

★Mexican exports, and destination of metals, for 1950 were as follows:

Gold (in grams)—U.S., 3,093,413; Iraq, 633,538; Indo Chino, 354,377; Lybia, 173,611; China, 77,759; French Morocco, 49,990.

Silver (kilograms)—U.S., 1,428,778; Chile, 62,344; Germany, 34,383; Canada, 7,776; Italy, 5,874; Colombia, 5,503; Switzerland, 5,000; Belgium, 448; Uruguay, 83; Sweden, 65; Great Britain, 13.

Copper (metric tons)—U.S., 51,789.

Lead (metric tons)—U.S., 219,392; Great Britain, 18,532; Brazil, 3,869; Holland, 1,150.

Zinc (metric tons)—U.S., 186,111; Great Britain, 6,022; Belgium, 5,221; India, 4,217; Brazil, 1,461; France, 1,231; Korea, 136.

Iron (metric tons)—U.S., 119,326.
Mercury (kilograms) — U.S., 120,-445; Switzerland, 3,554; Brazil, 2,554; Holland, 1,725.
Tin (kilograms) — U.S., 111,340; Great Britain, 62,904.

★**National Statistics Department** announced that total value of mining production for 1950 was 1,993,149,294 pesos ($231 million).

★Compañia Orleans, S. A., has bought Cia Fundidora, La Concha, S. A., which owns and operates an antimonial lead smelter at Pinal de Amoles, Queretaro, Mexico. It is anticipated that production will be doubled in the near future and eventually increased 400% over the present level of 100 tons per month. Fred A. Orleans will be general manager of the enterprise and J. Kellogg Burnham, formerly minerals attaché at Mexico City, will be managing director of the smelter.

★Although the Ministry of Finance is silent about reports in Mexico that plans are afoot for resumption of **minting Mexican gold** money as a means of checking inflation, Bank of Mexico sources admit that these plans are being considered.

Sponsors of the move count on traditional Mexican habit of hoarding hard money to produce counter inflationary trends—thus huge amounts of money would be withdrawn from circulation to acquire gold. Mexican gold money has not been minted since 1931 when the silver monetary system was adopted. Bank sources point to large imports of gold the institution has been making from U.S. as support of the contention that minting of gold money is looming. The Bank, however, contends that the gold, some 15 tons, is merely to strengthen the institution's metallic monetary reserve.

★Average **daily production of 120 tons of sulphur** is reported by Petroleos Mexicanos (Pemex) at the plant recently started at Poza Rica, in the Vera Cruz oil belt. Daily production will reach 200 tons by the end of 1951, according to Pemex plans.

IN THE PHILIPPINES

Decline in open-market gold price disturbs producers — Atok strikes copper

★Gold mine operators have been much disturbed by a heavy decline in the price of gold on the Manila open market. From a peak price of 160 pesos an ounce that was paid in April the price fell to 108 pesos by the middle of June, with few buyers showing interest.

Several reasons have been advanced

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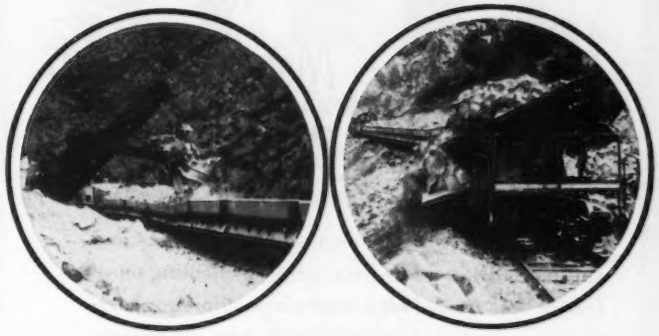

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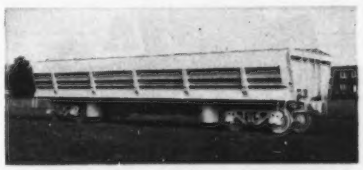

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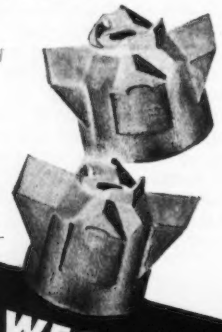

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Philippines *(Continued)*

for the precipitate drop which has left the gold producers in a very uncomfortable position. Heretofore the mines have been required to sell 25% of their bullion output to the Central Bank at 70 pesos an ounce, the statutory price, but were permitted to offer the balance of their production on the open market at prices far in excess of the legal rate. With operating costs per ounce generally in excess of 70 pesos, it was only because of the high free market price that the mines have been able to operate profitably. It was always known that most of the bullion went to Chinese buyers who contrived to smuggle it through to the Chinese mainland. The Philippine officials had viewed the situation tolerantly, no doubt believing that in the absence of a subsidy the gold miners needed the premium prices paid in the outside market to compensate for high postwar operating costs.

For reasons not disclosed, the Philippine government authorities suddenly reversed their position and put on a drive against the gold buyers which in effect put them out of business. No doubt the excuse was that the gold was reaching the Chinese Communists instead of supplying the local jewelry trade, as it was formerly euphemistically declared. But the actual result was to force the gold producers to hoard their bullion in the hope that the government would relax its drive against the open market.

The local Chamber of Mines protested vigorously to the government and pointed out that as long as the gold transactions were domestic, there was nothing in the Philippine laws or in the regulations of the I. M. F. to prohibit the sale above the statutory price. The gold mining industry is an important dollar producer for the Philippines, with a monthly gold output exceeding 31,000 oz.

But undoubtedly the price of gold expressed in pesos would have continued to fall because of the better demand for the Philippine peso with respect to the dollar. When gold was selling for 160 pesos an ounce, the peso was quoted about 4 to the dollar in the open market. With strict control over imports and the imposition of a 17% excise tax on foreign exchange, the peso improved in the international market and the gold price, in terms of pesos, declined accordingly.

★**Atok-Big Wedge** had the best production in May since the first of the year. While the milling rate was normal at 13,273 tons for the month, gross recovery jumped to $177,000 with the average value per ton milled increasing to $13.25. Interesting indications of a copper orebody have appeared on the lower levels. The company is diamond drilling a promising prospect south of the Lepanto Copper mine in the Mancayan area.

★**Consolidated Mines** operated by Benguet Consolidated shipped 9,800 tons of chromite ore in May and 18,450 tons in the first half of June to buyers on both the Atlantic and Pacific coasts. Since the first of the year the company has been receiving $12 a ton f.o.b. Masinloc for the ore. The price for the next six-month period is now under negotiation. It is reported that the stockpiling authorities have contracted for 250,000 tons of ore to be delivered within a year, provided shipments will not interfere with scheduled deliveries to buyers now under contract.

★**Surigao Consolidated** has developed into an outstanding Philippine gold producer. In May the value of the production was $172,000 from milling 9,248 tons averaging $18.80 per ton. On the 500 level a body of massive sulphide ore covering an area of some 9,000 sq. ft. has been developed which not only has an excellent gold content, averaging 0.5 oz. per ton, but also contains high values in copper, lead, and zinc. More than 100,000 tons of this ore have been developed. The zinc content of the ore on the lower levels has increased substantially and on the 500 level there is sufficient to warrant separate recovery of that metal. Experimental work is now being done on the ore at the mine and in

U. S. laboratories to determine the best method of treatment to produce a concentrate of shipping grade. Indications are that this orebody developed above and below the 500 level contains over 8 million lb. of recoverable zinc.

IN AUSTRALIA

Ship shortage holds up zinc concentrates — Rising costs hamper gold production

★**Australian gold production** for the first quarter of 1951 was 205,555 oz., an increase of 8,372 oz. over the corresponding period last year. March production of 69,686 oz. was the highest for the month since 1947.

NORTHERN TERRITORY

★**Carbonate Lead Mining Syndicate, Ltd.** will make a share issue of £10,000 for development of Wolfram Hill, N. L. Directors state that past production from the Wolfram Hill leases near Pine Creek has been 725 tons of an average grade of over 10% wolfram. According to a Bureau of Mineral Resources survey, Wolfram Hill is located 28 miles ESE of Pine Creek on the Darwin-Birdum railway. Nearly all of the wolfram has come from a quartz reef in metamorphosed slaty rocks one-third of a mile from granite. Three shoots appear to have been worked. They average 5 ft. in width, with a maximum length of 70 ft. and maximum depth of 200 ft. Chalcopyrite is associated with wolfram.

WESTERN AUSTRALIA

★Continuous rises in operating costs have already wiped out the premium which the 1948 devaluation conferred on gold producers, said Paringa Mining and Exploration Co.'s chairman in explaining a loss of £34,606 stg. for the year ended August 31, 1950. The mine showed a profit of £11,481 stg. in the previous year, though this was largely due to a government subsidy of £50,242. The chairman, Mr. C. S. Beale, stated that a go-slow strike seriously affected production for about two months. The company is going ahead with development work in an attempt to open up enough high-grade ore to raise the average value of reserves to a profitable level.

VICTORIA

★Victoria's gold yield for the first four months of 1951 was 16,747 oz., a decrease of 105 oz. compared with the same period of 1950.

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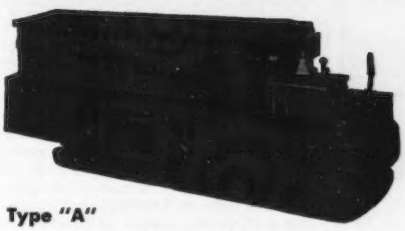

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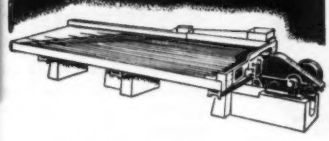

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FORT WAYNE 4 INDIANA

Australia *(Continued)*

★**Central Victoria Dredging Co.'s** remodeled bucket dredge began operating at Amphitheatre on June 12. The dredge will be occupied for some weeks in opening out a dredging pond and deepening it to bedrock. It is estimated that the 400-acre lease contains 20 million cu. yd. of material.

★Stockholders in **Morning Star (G. M. A.) Mines, N. L.** will hold an extraordinary meeting to consider electrification of the mine and an increase in capital from £80,000 to £100,000 to meet the cost. Apart from providing power for continued mining at depth, large savings in fuel expenditure are expected to result from electrification.

TASMANIA

★**Total value of minerals and metals** produced in Tasmania in 1950 was £5,706,000, compared with £3,974,000 in 1949. Much of the increase was due to higher market prices and output of wolfram and scheelite actually declined in physical volume. However, copper production was more than 2,000 tons higher and zinc production from both Tasmanian and mainland ores set a record.

Prospects of duplicating this record this year are bleak as the **Electrolytic Zinc Co.** has been operating for several months under severe power restrictions which are causing a production loss of nearly 1,500 tons monthly. Supplies to both domestic and overseas markets have been cut by approximately 25%. The Risdon refinery is producing at the rate of less than 70,000 tons a year, compared with last year's record output of 83,680 tons.

★**Montana Silver Lead, N. L.** reports that the production stage is expected to be reached shortly. The ore bins have been filled to insure a supply of ore when the mill opens. Primary crushing and conveying equipment has already been given a trial run. The Zeehan-Dundas area, which is the setting for this comeback, produced ore with a lead content of more than 200,000 tons between 1888 and 1941, reaching a maximum output of 19,675 tons in 1909.

NEW SOUTH WALES

★Production of **New Occidental Gold Mines** for the year ended June 3 was lower than in 1949-50 in spite of increased output. At the New Occidental mine, 96,696 tons were treated for 25,006 oz. of gold, contrasting with 30,439 oz. from 92,399 tons in the previous year. At the Chesney mine, 52,863 tons were sent to the mill for a return of 3,003 oz. of gold and 788 tons of copper. In 1949-50 the yield was 3,017 oz. and 796 tons from 51,829 tons of ore.

Here's Why it Pays You to Read the Advertising

The advertising is a rich source of valuable information. In this magazine it offers you ideas and products that may well apply advantageously to your business.

Every issue is a catalog of goods, materials, and services — quickly available to you—just for the reading.

Leaders in business and industry turn to the advertising because they've discovered it helps them run their businesses more profitably.

When you read all the ads in this magazine, the chances are good that you'll get a lead that will materially help you do a better job. For example, you may find a specific piece of equipment that will be a profitable time-saver. Or a tool that will increase worker efficiency. That's why it pays to read the advertising. It's good business.

HEADQUARTERS FOR BUSINESS INFORMATION

McGRAW-HILL publications

QUEENSLAND

★During the year ended June 30, 1950, **Tableland Tin Dredging** produced 591 tons of tin concentrate compared with 484 tons in 1948-49. The Return Creek lease, from which this production came, is expected to be worked out in less than two years, but the company has acquired a new dredging area at Smith's Creek estimated to contain 50 million cu. yd. averaging 11.46 oz. This property will insure a further working life of 10½ yr. for the dredge. The dredge will have to be transferred about 6 mi. to the new area.

★Large quantities of zinc concentrates have accumulated at **Mount Isa** as there are not enough ships available to carry them. The company has chartered two foreign vessels to meet commitments to Dutch smelters. Total shipments of mineral products from the port of Townsville in June are expected to reach 13,000 tons.

★**Kingston (Open Cut) Gold Mines, Ltd.** has unexpectedly struck ore in the process of excavating foundations for a stone crusher in the floor of the open cut, and cutting an inclined shaft through which ore is to be conveyed from the crusher to the ore bins. The belt conveyor shaft was sunk in ore from 40 ft. to 102 ft. and from 140 ft. to 214 ft. 6 in., all of average mill grade. This has proved payable ore values 30 ft. below the deepest workings. A second ball mill is to be installed.

IN AFRICA

ECA to finance copper-cobalt project — More gold mines plan uranium extraction

★A net profit for 1950 of 126,770,000 Belgian francs is reported by the **Societe Miniere du Beceka** (operating at Katanga, Belgian Congo). This figure represents an increase of more than 28,000,000 francs over the 1949 figure of 98,560,000 francs.

Beceka's diamond production in the past year reached 9,600,000 carats, against 9,090,000 in the previous period. The production of gold was resumed towards the end of 1950, but attained only about 20 kilos.

Eight thousand tons of manganese ore was produced last year by the company "Beceka-Manganese", founded in 1950 with the support of Miniere du Beceka.

★Plans to put up £3 million sterling of American Marshall Plan money to develop a new copper and cobalt mine in Northern Rhodesia were reported recently. The plans concern the Chibuluma property, owned by Mufulira, which is controlled (though not wholly owned) by the American Metal Com-

Why do Card Wheels resist wear so much longer?

■ Unretouched photo of rim section from a card Semi-Steel Heat-Treated wheel. Note depth and uniformity of chill in tread and flange.

The job of improving and controlling the metallurgy of Card Wheels never stops. They are close-grained, strong, tough, and excel in wear resistance. Years of cost-cutting service in hundreds of mines prove it!

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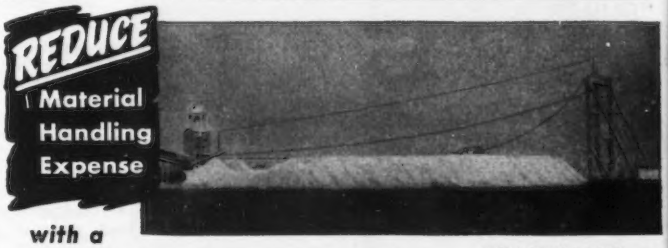
Denver 1, Colorado



with a

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Speed up dig-and-haul work with the efficient Sauerman Power Drag Scraper. A single, easily trained man can handle all jobs in one continuous, automatic operation . . . can dig a heaping load — haul material to any point within an operating radius of 1,000 ft. or more — return the streamlined Crescent scoop at high speed to dig another load.

First cost is reasonable, upkeep is simple and power consumption is moderate. Total operating expense adds up to only a few pennies per ton handled. And the equipment has an amazingly long life because the main wear falls on just a few easily replaceable parts. Sauerman scraper machines installed a quarter of a century ago are giving steady service and are considered as good as new by their owners.

STORY BEHIND PHOTO

One of the materials processed at a large metallurgical plant is crushed limestone brought in by boat. During the navigation season 200,000 tons must be stored for use during the winter. This is accomplished by a 4 cu. yd. Sauerman Crescent Scraper operating radially on a 550 ft. span between a headpost and a self-propelled tail tower. In the winter the scraper is turned around on its cables and reclaims to a hopper at the plant.

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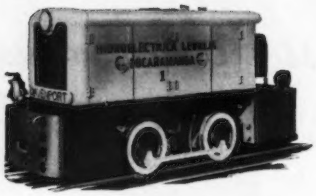

Available in STEAM FIRELESS GASOLINE DIESEL with ELECTRIC or HYDRAULIC or MECHANICAL DRIVE

In the selection of a locomotive as to size and type, it is important to meet the particular requirements of the conditions under which it is to operate—and the work to be done. If the unit is too large, valuable power is lost; if too small, precious time is lost.

Let Us ANALYZE *Your Needs*

We would regard it as a privilege to analyze your haulage needs and to recommend a locomotive FITTED to those needs. All without obligation on your part.

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DAVENPORT BESLER CORPORATION
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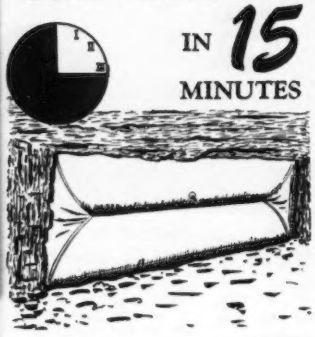
"BUILD" A BRATTICE IN 15 MINUTES



It's ABC's revolutionary new airtight *Inflatable Brattice!* Think of it—a brattice that can be transported, erected and disassembled by *one man*—erection time 15 minutes! ABC *Inflatable Brattice* goes up in one unit, comes down in one unit—with a simple air pump the only erection equipment required. Molds itself around sloping or jagged edges for an *airtight* fit. Its tough neoprene fabric lasts far longer—for installation after installation without noticeable wear. For unequalled Brattice Installation and service-life economies, write ABC direct . . . now!

ABC AMERICAN BRATTICE CLOTH CORP.
220 S. Buffalo St., Warsaw, Indiana

Africa *(Continued)*

pany of New York through the Rhodesian Selection Trust. The ore in this property is believed to contain over 5% copper and 0.25% cobalt.

No announcement from either the Governments or the companies concerned was expected for some time. American and British officials are discussing how the eventual output shall be fairly shared internationally. This is looking well ahead, since at best it will be some years before Chibuluma can come into production, particularly as Rhodesia has well-known difficulties of labor and fuel.

ECA has offered to lend Mufulira the £3 million sterling to develop the deposit, and to take the output at a guaranteed price until the loan is repaid. A private American company was believed to have chipped in with an offer to put up the money on terms more favorable to Mufulira, but it was thought that the ECA plan would prevail.

★Two more South African gold-mining companies have announced financial arrangements for the erection of plants for the extraction of uranium from the residue slimes of their gold production plants.

They are Blyvooruitzicht ("Blyvoor"), the world's richest gold mine, and its next-door neighbor, West Driefontein.

Both companies had previously announced contracts with the South African Atomic Energy Board for the uranium plants. The latest announcements were of increases in their borrowing powers, to provide for the loans which they will obtain (from official sources) for the capital costs of the plants.

The costs were roughly estimated at £2½ million sterling for Blyvoor and £2 million for West Driefontein.

IN EUROPE

ITALY

★Italian **mercury exports** rose to 2,841 tons in 1950, nearly ten times the amount shipped in 1949. This has exhausted the surplus stocks accumulated by the two Italian mercury companies during the three previous years. In view of the changed situation the Monte Amiata company has decided to reopen the mercury mine at Morone which stopped production about 20 years ago.

★Old type methods used by Sicilian mines to **extract sulphur** from ore yield on an average only 65% of the sulphur content. Consequently studies are now being made to utilize flotation and thermal methods of extraction to increase recovery. The possibility of using anhydride from the Gill furnaces now in use at chemical plants at the mines is also being considered.

★A bill now before the Italian Senate would authorize loans to mining companies, not exceeding 9 billion lire, **for increasing mine output of sulphur.** The appropriation to be made is in addition to the 950 million lire recently granted the Italian Sulphur Corp. to encourage the output of sulphur and centralize sales of Italian sulphur in foreign markets.

★**A new plant for processing zinc ore** in Italy is being completed at Gorno, Bergamo Province. The plant will produce 18,000 tons of zinc ingots a year.

By 1952, when the new plant will commence operations, total output of zinc ingots will amount to 70,000 tons a year. This will leave a large margin for exports, since domestic consumption is not over 35,000 tons a year.

AUSTRIA

★Plans to increase production from **the Styrian iron ore mines** from the present level of 5,500 tons to 7,400 tons per day are estimated by the Economic Cooperation Administration to require the investment of $2,326,000. ECA is allocating $635,000 for the purchase of American machinery and equipment. Austria herself is planning to raise daily output to 9,000 tons in order to supply the Linz iron works.

Why so many ore miners O.K. Du Pont "MS" Caps . . .

SAFETY—These short-interval "MS" (millisecond) Delay Caps assure greater safety. They eliminate the possibility of dynamite in the muck pile and sharply reduce the number of bootlegs. Their colored tags make them clearly and readily identifiable. "MS" Delay Caps have nylon-insulated wires and extremely water-resistant rubber-plug closures. And, aluminum-foil-shielded shunts materially reduce the risk of premature firing due to stray currents.

ECONOMY—Increased operating efficiency obtained with Du Pont "MS" Delay Caps means added savings. In addition, "MS" Delay Caps often enable you to use less explosives per ton of ore.

BETTER FRAGMENTATION — Mine operators have found that "MS" Delay Caps consistently provide superior fragmentation . . . with less vibration and concussion. Even badly fractured veins break well when "MS" Delay Caps are used. And the uniformly fine breakage reduces costly secondary blasting.

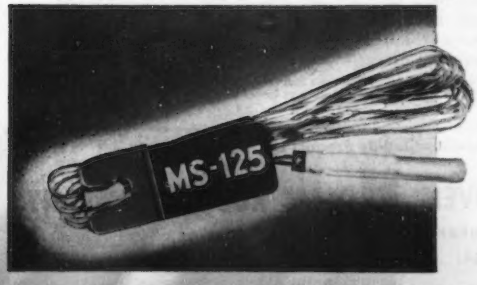
* * *

Why not do as many experienced mine operators have done—switch to dependable Du Pont "MS" (millisecond) Delay Electric Blasting Caps? Any Du Pont Explosives representative will gladly give you complete information on these efficient caps. Talk to him soon. E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.

Available in 14 millisecond intervals of delay: MS-25, -50, -75, -100, -125, -150, -175, -200, -250, -300, -350, -400, -450 and -500.

Easy to handle, easy to work with, "MS" Delay Caps have grown in popularity because they are as safe as they are efficient. These caps can be readily hooked up without error because every delay period is clearly marked for positive identification.

Excellent fragmentation consistently obtained with "MS" Delay Caps helps keep operations right on schedule . . . boosts production . . . lowers cost. These caps substantially reduce concussion and vibration.



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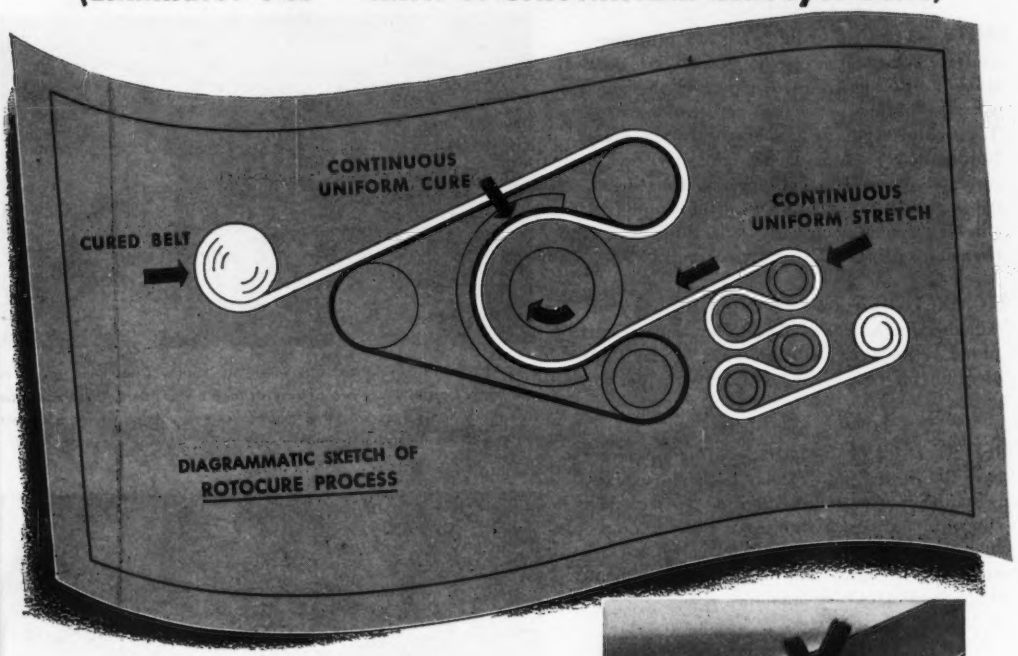
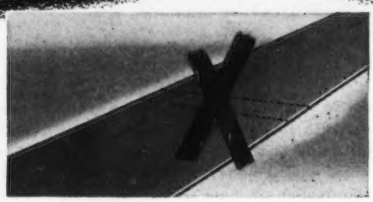
BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

The Principle of ROTOCURE is Simple – the Results Dramatic

(Eliminates OCS – killer of Conventional Conveyor Belts)*



Place a hot flatiron too often on the same spot of a pair of pants and you weaken the fabric. Use conventional flat press methods of curing belting and *you weaken the structure similarly.* Flat press curing cannot help but result in these overcured segments because these sections (2″ to 4″ long across the belt width) get a double "treatment" as previously cured areas advance *less than a full press length.*



*Overcured Sections — present every 30′ to 40′ in all belts made by the flat press method. Only Rotocuring (*continuous, non-stop* curing) eliminates this major cause of belt failure.

Not so with ROTOCURE. In this *continuous* method of vulcanization double curing due to press overlapping is eliminated because the belt is in constant uniform motion. Product-wise you get these vital advantages:

1. Increased belt flex life — as much as 40% . . . **2.** Elimination of mechanical distortion at the press ends . . . **3.** Constant, uniform stretch . . . **4.** Uniform, abrasion-resistant covers.

These product advantages are paying off for BWH Conveyor belt users in more work hours per belt, savings per ton in materials conveyed and rock bottom maintenance costs. Are *you* one of them? If not, ask your BWH distributor or write us direct.**

**At the same time, get the story on BWH rotocured transmission belts which permit operation at lower tensions.

BWH
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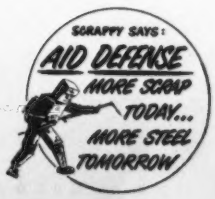
Unless dwindling scrap piles are replenished immediately, steel production will suffer. *Extra* scrap is needed—above and beyond the "working" scrap which steel users regularly sell.

Comb YOUR Mine!

How much valuable scrap do *you* have just lying around? Old machines and equipment . . . useless parts . . . odds and ends. This is the kind of scrap that's urgently needed now. It will get more steel for everybody.

Here's a Quick Way-

Put *one* man in charge of getting all the scrap in your operation collected and turned over to your scrap dealer. Set the date for the job to be done.



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insist on Walseal® products and be certain

– the FACTORY INSERTED Ring insures FULL PENETRATION of the Silver Alloy . . . a perfect joint

Today, contractors . . . builders . . . architects are using brazed connections, in ever increasing numbers on their brass and copper pipe runs. However, they must be certain that the correct brazing alloy is used; that the joint has penetration of alloy up the shoulder of the fitting.

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Furthermore, it is a relatively simple operation to make a Silbraz joint – no heavy scaffolding need be erected . . . just cut the pipe, flux, assemble, then braze, following the technique recommended by the Walworth Company. A silver brazing alloy – FACTORY INSERTED – in each port flows out when heated with the oxyacetylene torch, making a joint that is stronger than the pipe itself . . . a one-hand operation, with the mechanic out of the path of the deflected heat – at all times.

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For the last ten years, a U. S. Rubber Conveyor Belt has been carrying run-of-mine coal from the foot of one of the Cumberland Mountains to a tipple. Millions of tons have been carried by the belt since its installation. Yet this "U.S." belt has many years of service remaining, despite its 10-year performance.

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Overall view of installation with 48" wide, 1000' center-to-center belt in the foreground.

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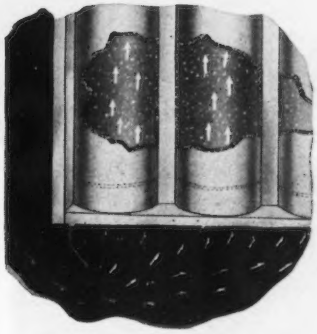
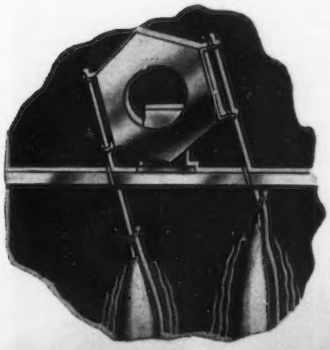
Tubes are rapidly replaced by one man working from the clean air side and condition is readily determined without removing parts.

Tubes are expanded tightly into cell plate to prevent dust leakage. Compartments can be isolated for maintenance while balance of Collector operates.

Tubes are compact, easy to store and ship. They are never under tension — never in contact with metal that might abrade or corrode the fabric.



Few working parts give continuous service with a minimum maintenance for heavy duty installations in smelting, rock product and mining applications.



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You pay less for dust and fume recovery when you use a Dustube. By combining the proven efficiency of cloth filtration with a unique operating simplicity, Dustube Collectors remove dust thoroughly at low cost. Uniform recoveries approaching 100% are commonplace and the collected material can be reprocessed without de-watering, filtering or drying.

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It will pay you to investigate the many cost-cutting advantages of Dustube Collectors described on this page. Write for complete information today.

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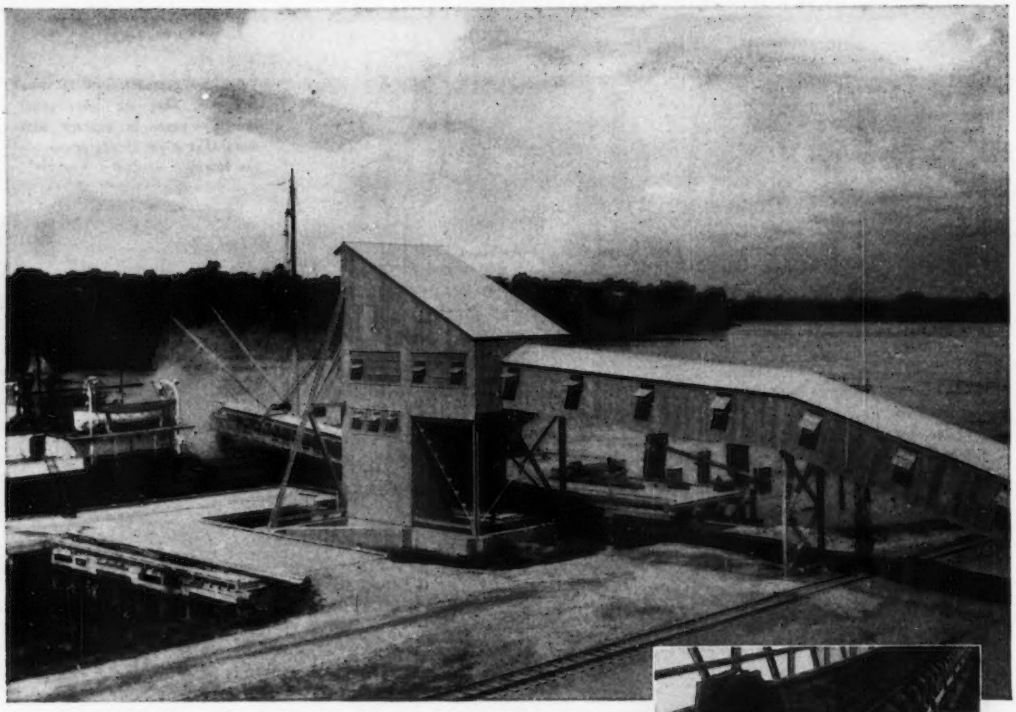
COLLECTORS



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This port facility for preliminary processing, handling and loading bauxite ore on shipboard is built around an S-A Conveying System. Fast handling was specified as essential with strict economy in handling costs of equal importance.

S-A Belt and Pan Conveyors move the ore through successive steps of crushing, washing and kiln treatment, re-claim from storage—then deliver ore by boom conveyor to ship's hold and distribute it evenly to assure maximum utilization of cargo space.

If you have a conveying problem, it is likely that S-A can help you by recommending the most suitable type of equipment for your needs—*the S-A equipment line is complete.* You profit by long experience with hundreds of other conveyor installations for the mining field, in consulting S-A engineers. *Write today!*

S-A SHIPLOADING INSTALLATION

Ore is reclaimed from storage piles by S-A Belt Conveyors and is conveyed to the ship loading dock. An S-A Boom Conveyor, which extends out over the ship's hatch, is fitted with an S-A Centrifugal Boat Trimmer unit that distributes the ore through a swivel mounted thrower unit to all parts of the hold—rapidly, evenly and economically.

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50 years experience with bulk handling

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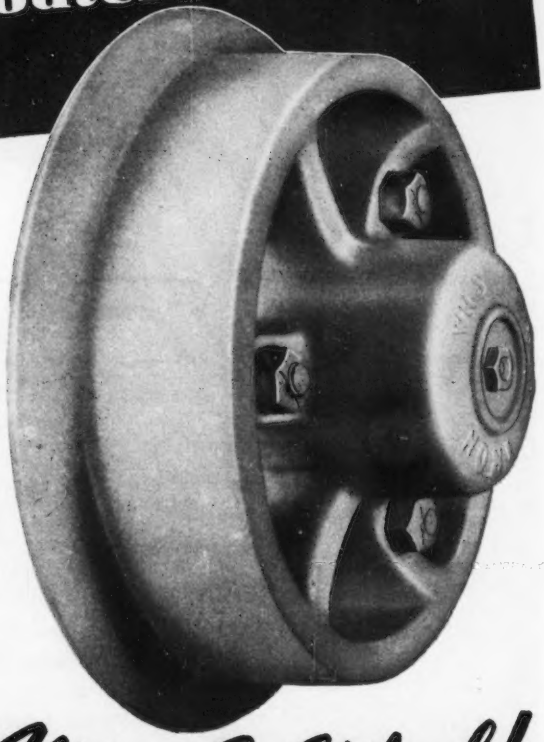
Performance records prove...

...with practically no maintenance..you'll haul up to 50% greater loads on S-D "Floaters"...



Tests conducted by independent engineering firms and performance records at the mine have proved that locomotives will pull up to 50% greater loads, when cars are equipped with S-D "Floater" Wheels, instead of wheels with other types of precision bearings. But this saving in power and time is only a portion of the profit you gain by using S-D "Floaters." When it comes to maintenance you really pick up profit because S-D "Floaters" literally "hate to be greased." One greasing in 5 years is often sufficient. Common labor can demount and remount a "floater" wheel easily . . . in less time than it takes to smoke a cigarette, because no adjustment whatsoever is necessary on the bearings. Add to this the fact that the big cause of bearing failure (bearings running too tight or loose) has been eliminated and you can understand why more and more operators are specifying S-D "Floaters" for all wheel replacements. For complete information, write Sanford-Day Iron Works, Knoxville, Tenn.

America's No. 1 Mine Car Wheel!

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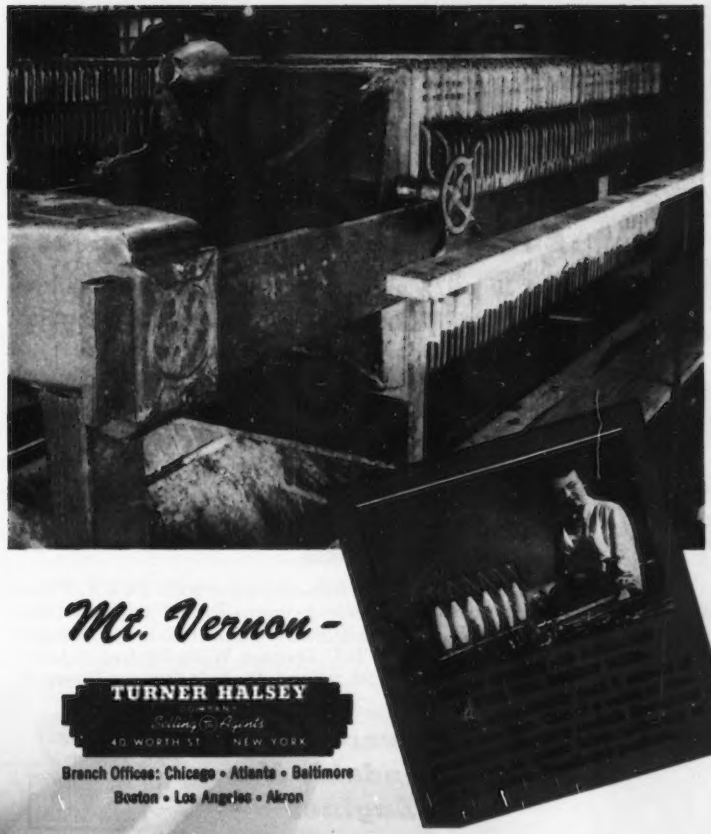
UNIFORMITY FILTER

MT. VERNON EXTRA

Gives You Greater Fabric Uniformity



The greater uniformity of Mt. Vernon Extra means more efficient filtering — greater clarification of filtrates, more complete recovery of solids.

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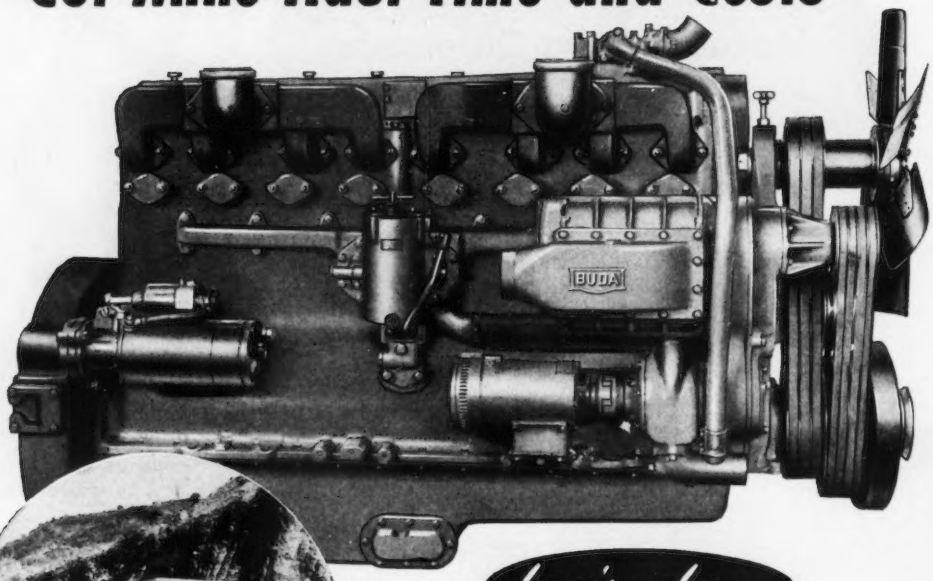
Big 350 h.p. BUDA Super Diesels

Cut Mine Haul Time and Costs



Buda 1125 Dyna-Swirl Diesel powers this Model 140 Dart Truck at Bagdad Copper Corp.

Model 140 DART powered by Buda 1125 Super Diesel hauls 22 ton payloads up 12% to 18% grades with 5 switchback turns at 4 MPH in 4th gear.

here's why....

BUDA Dyna-Swirl DIESELS give:

- ★ 10 to 17% higher usable torque (lugging ability).
- ★ 12 to 18% more horsepower at normal operating speeds.
- ★ 6,000 or more operating hours between major overhauls.
- ★ Less operator fatigue—smoother operating—less noise—less smoke—less vibration.
- ★ Controlled governor action and progressive starting definitely easier on clutches, transmissions, final drives and tires.

Give old Units new life—repower with BUDA. There are no finer precision-made Diesel engines than BUDAS! Ask your Buda Distributor for the facts today on the BIG new "DA" Diesels. Write for free colorful bulletin and specifications. ***The Buda Company, Harvey, Ill.***

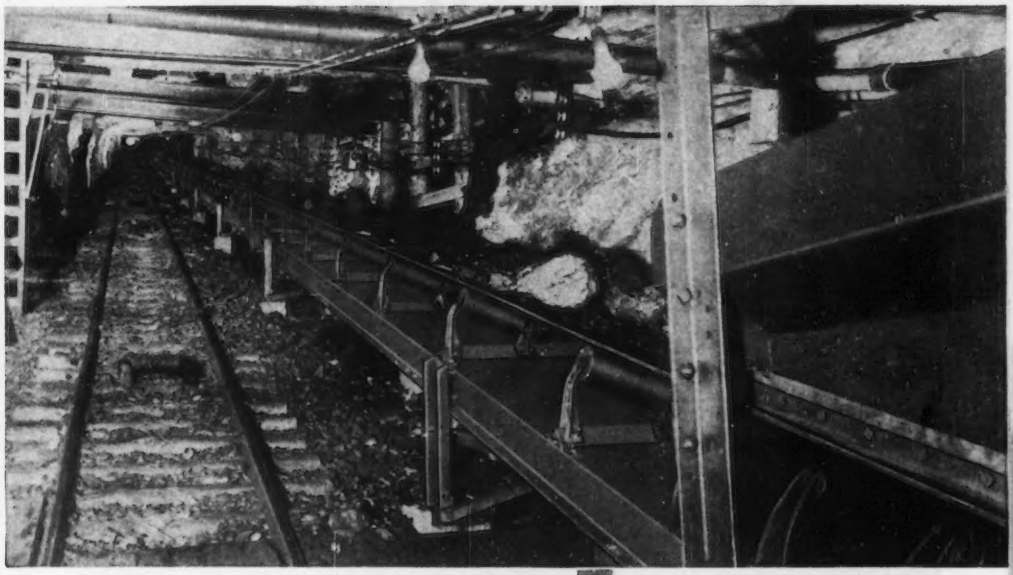
BUDA

a Power-Full and Dependable Name in Engines

BUDA COAST TO COAST FACTORY EXPERIENCED SERVICE AND PARTS

BC-11

12,500,000 TONS HANDLED...



was just a start for Rex Idlers

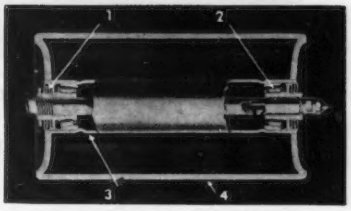
You'd think that carrying 12,500,000 tons of material would be a lifetime job for any belt conveyor idlers. After these rugged Rex Idlers handled that amount of aggregate for the Shasta Dam as a starter, the same idlers were installed on the longest, highest belt slope conveyor in regular service. And they're still going strong.

That's real proof that Rex Belt Conveyor Idlers give you lowest cost service . . . that they eliminate costly down time caused by premature idler failures. Not only do Rex Idlers last longer, they also are easy on the belt. They eliminate destructive belt pinching and creasing, and absorb practically no power. Special application idlers, such as Rex Impact Cushioning Idlers illustrated above (lower right hand corner), installed under loading points, protect belt from laceration and carcass failures.

For the complete story on these cost-cutting idlers, mail the coupon for your copy of Bulletin No. 463R.

CHAIN BELT COMPANY REX BELT CONVEYOR IDLERS

These Rex Quality Features Add Life to Your Conveyors



1. **Triple labyrinth grease seal . . . dust stays out, grease stays in.**
2. **Tapered roller bearings, deadshaft type mounting, oversize capacity.**
3. **Unit mounting for bearings for positive alignment and minimum friction.**
4. **Heavy duty one-piece welded steel construction for maximum roll life.**

CHAIN BELT COMPANY 50-200
1679 West Bruce Street
Milwaukee 4, Wis.

Gentlemen:
☐ Send me my copy of Bulletin No. 463R.
☐ I would like to see a Rex Field Sales Engineer.

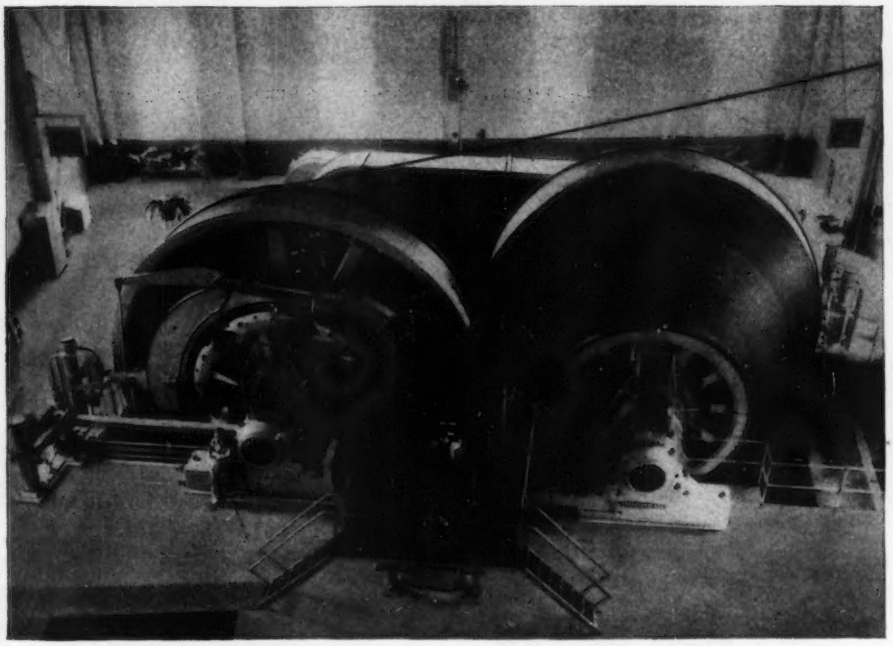
Name.....

Company.....*Dept*.....

Address.....

City.....*State*.....

WIRE ROPE



For shaft, incline and haulage service specify Roebling

WHEREVER WIRE ROPE is subjected to excessive abrasion or bending and acceleration stresses . . . to heavy loads and high speeds . . . the proper Roebling Preformed "Blue Center" Steel Wire Rope will last longer and save money. "Blue Center" steel is an exclusive Roebling development that assures real toughness. Roebling Preformed also adds extra handling ease and smooth performance.

Roebling makes a full line of wire rope. Have your Roebling Field Man recommend the ones that will meet your needs with top efficiency and economy. And for biggest savings, get his advice on the correct use and maintenance of wire rope. John A. Roebling's Sons Company, Trenton 2, New Jersey.

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Atlanta, 934 Avon Ave ★ ***Boston,*** 51 Sleeper St ★ ***Chicago,*** 5525 W. Roosevelt Rd ★ ***Cincinnati,*** 3253 Fredonia Ave ★ ***Cleveland,*** 701 St. Clair Ave, N.E. ★ ***Denver,*** 4801 Jackson St ★ ***Detroit,*** 915 Fisher Building ★ ***Houston,*** 6216 Navigation Blvd ★ ***Los Angeles,*** 216 S. Alameda St ★ ***New York,*** 19 Rector St ★ ***Odessa, Texas,*** 1920 E. 2nd St ★ ***Philadelphia,*** 230 Vine St ★ ***San Francisco,*** 1740 17th St ★ ***Seattle,*** 900 1st Ave, S. ★ ***Tulsa,*** 321 N. Cheyenne St ★ Export Sales Office, ***Trenton, N. J.***

Not pious hopes but .... Figures

So many opinions, so few real facts on abrasive wear! Here are figures of long-time tests from actual ore-grinding practice.

Write for 32 pp reprint of an informative paper published by the Amer. Inst. of Mining and Metallurgical Engrs., giving results of wear tests on grinding ball materials—FREE!

Case No. 5

Tests at a large mine grinding low-grade copper ore.

Service: Marcy 10′ × 10½′ grate discharge type ball mills grinding minus ¾″ feed to 84% minus 100 mesh. Mill speed 18 rpm. Balls charged were 2½″ and 2″ dia.

Comparison: Between one set of austenitic manganese steel grates in concurrent service with chromium-molybdenum cast steel grates, (normalized and tempered to 275 Brinell).

Grate Type: Marcy design cast steel with slot openings ¾″ to ⅞″ wide.

Results:	Life—Days	Tons—per set
Manganese Steel	323 *	590,703 *
Cr-Mo Steel (ave.)	402	739,242

* Manganese steel grates removed before completely worn out, due to excessive peening of the bars, which closed-up the slot openings.

Case No. 6

Tests at a large mining operation grinding copper ore.

Service: Marcy 9½′ × 12′ rod mill grinding minus 2″ feed to minus 10 mesh. Speed 16.6 rpm. Replacement rods were 3″ dia.

Comparison: Between one set of martensitic (Ni-Hard) liners and one set of high carbon chromium-molybdenum cast steel liners, (salt quenched and tempered to 350 Brinell).

Liner type: Shell (barrel) liners with specially designed square corner lifter.

Results:	Tonnage ground
Martensitic white iron	348,000 *
Cr-Mo Steel	404,426

* Several liner plates in this set replaced due breakage before remainder were worn out.

Climax Molybdenum Company
500 Fifth Avenue · New York City

Please send your FREE Reprint on "Wear Tests"

Name .....
Position .....
Company .....
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MOLY

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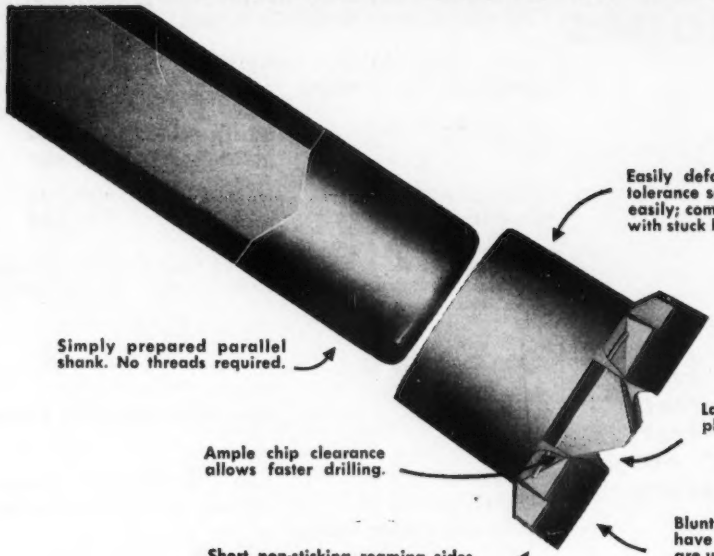
THROWAWAY


Easily deformable skirt with close tolerance socket hole . . . bit goes on easily; comes off easily; no lost time with stuck bits.
Simply prepared parallel shank. No threads required.
Large hemispherical non-plugging water outlet.
Ample chip clearance allows faster drilling.
Blunt non-breaking cutting edges have self-sharpening tendency — are uniformly hard.
Short non-sticking reaming sides allow close gauge following.

LOWER YOUR DRILLING COSTS

with

THE "ORIGINAL" ONE-USE BIT

Increased Rod Life with this Strongest and Cheapest Connection

Maximum Footage – Above Average Hardness

Minimum Breakage with Tougher Sockets

Made in All Gauges

THE "TEST" WILL PROVE ITS WORTH

THROWAWAY BIT CORPORATION

4200 N.W. Yeon Ave. **Portland, Oregon, U.S.A.**

Fully descriptive literature on all products is available. Competent field engineers and dealers are always at your service.

Some territories still open for distributors and jobbers.

Steel

BULWARK OF FREEDOM, BUT . . .

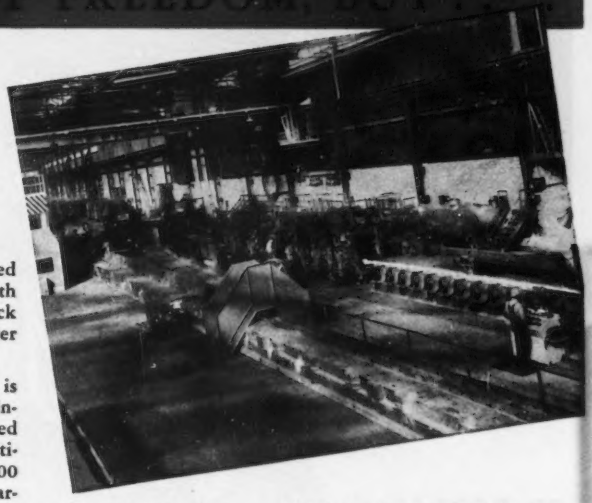
Vulnerable to Socialistic Rust!

Urged on and on by the incentives afforded by our free enterprise system—Americans, with the private money of thousands of stock holders, have built a Bulwark of Steel greater than all the rest of the world.

The capacity of America's steel industry is so great that in 24 hours, it can turn out ingots and castings sufficient to provide finished steel for—500 airplanes, 500 tanks, 1,000 anti-aircraft guns, a half million 3-inch shells, 1,000 howitzers, 2,000 aerial bombs, 1 aircraft carrier, 2 heavy cruisers, two cargo ships, two tankers, 1,000 freight cars, 2,000 trucks, 12,000 automobiles, 20,000 refrigerators, 20,000 stoves, 2,000 homes, and still have 23,000 tons of steel for other purposes.

Remove the incentives of free enterprise or burden it with excessive restrictions and our magnificent steel industry will be vulnerable to the wasting erosion of socialistic rust.

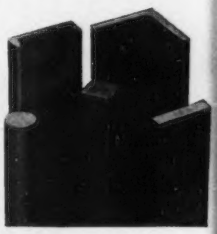
SHEFFIELD
STEEL
CORPORATION
HOUSTON KANSAS CITY
TULSA
SUBSIDIARY OF ARMCO STEEL CORPORATION



Most Modern of Merchant Mills

On this highly mechanized 12-inch merchant mill, steel billets are more efficiently rolled into a wide variety of merchant shapes and sizes vital to manufacturing.

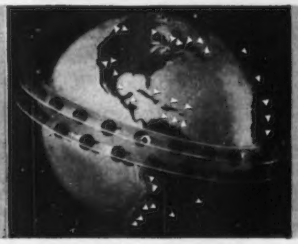
It is a typical example of the continuing modernization and expansion program of Sheffield Steel which, in the last ten years alone, has more than tripled the at-home steel making capacity of Sheffield Steel mills. New furnace and blooming mill capacity now under construction will enable Sheffield Steel to continue to pace industrial progress with an ever increasing supply of steel—the vitamin A of industrial growth.



SHEFFIELD
MERCHANT STEEL

There are few industries that do not use merchant steel. Sheffield Steel mills roll a wide variety of bars and shapes.

SHEFFIELD
MOLY-COP
TRADEMARK REG.
COPPER-MOLYBDENUM-ALLOY
Grinding Balls



USED AND PROVED ALL AROUND THE WORLD

Sheffield Products: Carbon and Alloy Steel, Ingots, Blooms, Billets, Plates, Sheets, Hot Rolled Bars, Steel Joists, Structural Shapes, Reinforcing Bars, Welded Wire Mesh, Wire Products, Wire Rods, Fence, Spring Wire, Nails, Rivets, Grinding Media, Forgings, Track Spikes, Bolt and Nut Products

Export Representative: ARMCO INTERNATIONAL CORPORATION • Middletown, Ohio

MORE SCRAP MEANS MORE STEEL • TURN YOURS IN TODAY!

stay on the job

CP PORTABLE COMPRESSORS

Built for dependability, CP PORTABLE AIR COMPRESSORS have a well-earned reputation for staying on the job and cutting operating costs.

Providing "600 cubic feet of air on wheels," the Diesel-driven CP-600, powered by a six-cylinder Caterpillar engine and with a V-8 compressor, is notable for smooth, economical performance.

It is fuel-thrifty because the gradual speed regulator adapts engine speed to air demands, also minimizing engine wear and reducing maintenance.

Other features of this two-stage, air-cooled compressor include pressure lubrication, large Simplate valves and self-adjusting clutch.

CP Portable Compressors are available in gasoline-driven models from 60 to 315 cfm actual capacity, and in Diesel-driven models from 105 to 600 cfm capacity.

Write for detailed information.

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
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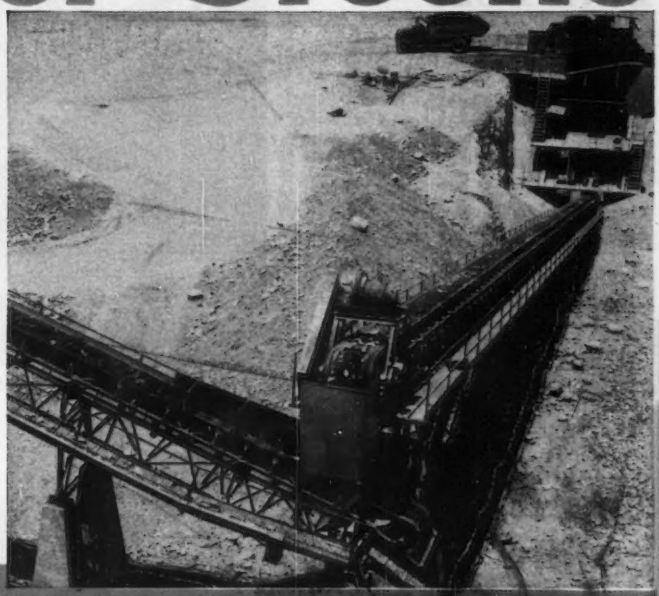
Barber-Greene

B-G

Redi-Fab BELT CONVEYORS



EASY SELECTION FROM CATALOGED UNITS

Experience has shown that most of your belt conveyor requirements are met by units that form a specific segment of the vast Barber-Greene Conveyor line. That segment is the Redi-Fab series—the conveyor sizes you most frequently need. These conveyors have been accurately and conveniently cataloged in a wide variety of small increments of width, length and lift. Moreover, Redi-Fab series components—sections, drives, takeups, power units, terminals and complete accessories—are "packaged" for off-the-shelf delivery.

FAST QUOTATION, DELIVERY, ERECTION

Actually, you can select your Redi-Fab Conveyors, and order the proper components, directly from Catalog RF—an entirely new approach to conveyor selection. Better still, work with your B-G distributor representative. Without costly time-consuming engineering, you can choose the conveyor that exactly meets your needs. Quotation and delivery are faster because [illegible] from standard, pre-built units normally [illegible] B-G distributor or factory stock. Erection is [illegible] and units are delivered clearly marked for [illegible].

NOW More than ever, machines must be used most effectively. Redi-Fab Conveyors offer the fast, sure way to release shovels, cranes, tractors and the like for more productive work — to minimize man power requirements and increase productivity. Send for your copy of Redi-Fab Catalog RF.

BARBER-GREENE COMPANY

AURORA, ILLINOIS, U.S.A.

send for Redi-Fab catalog

The new 40-page catalog makes it simple for you to figure your own conveyor requirements if you wish. No knowledge of horsepower required. The catalog makes possible the proper selection of the conveyor with the correct size of drive and motor. In fact, with the new layout sheet in the Redi-Fab Catalog, you can make your own layout — accurately, down through all details including the A-frame supports. Write for your copy, or ask your B-G distributor.

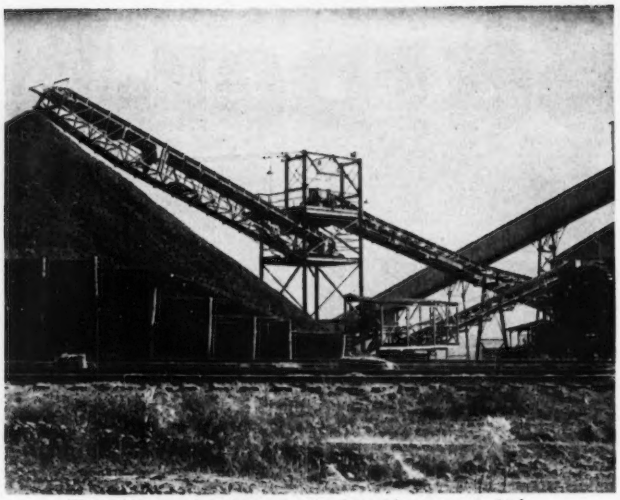
202A

LINK-BELT engineering experience...

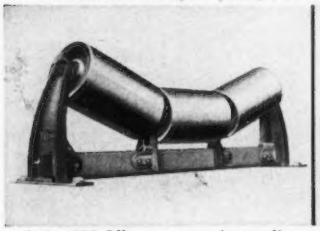
Plus

LINK-BELT quality components...

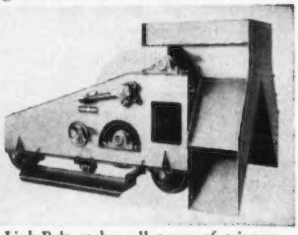
...add up to your best buy in BELT CONVEYORS



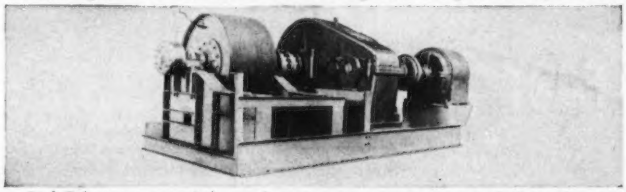
Washed iron ore is stocked out and reclaimed by means of a Link-Belt belt conveyor system, including a 60-foot radius stacker.



Series 100 Idlers are superior quality, with high-grade roller bearings and effective grease-in-dirt-out seal.



Link-Belt makes all types of trippers for discharging materials and distributing them along the conveyor belt.



Link-Belt power transmission equipment meets every conveyor need. Shown here: Link-Belt 300 H.P. fluid coupling drive and D-250 herringbone gear reducer.

YES, you get *both*—practical engineering and quality components—when you call on Link-Belt for belt conveyors! Thousands agree Link-Belt makes the finest belt conveyors on the market today.

Engineering experience? Our conveyor specialists draw on an accumulation of years of materials handling and power transmission experience. They will help you and your consultants get top performance from a modern conveying system.

Quality components? We design every item on a belt conveyor system and build it to the highest standards. We make all types and sizes of idlers, take-ups, pulleys, trippers, bearings, drives and supports. You get the *right* equipment for your exact requirements when you rely on Link-Belt.

See for yourself! Let us show you some of the modern conveying systems we have installed. See the results of practical Link-Belt engineering experience—simplicity of design, the finest components, and most important, *top performance.*

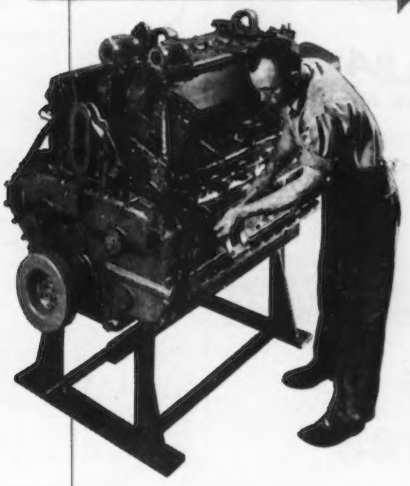
Remember, there's a Link-Belt conveying specialist in the branch office near you. Call him for complete engineering information.

LINK-BELT

BELT CONVEYOR EQUIPMENT 12,301-F

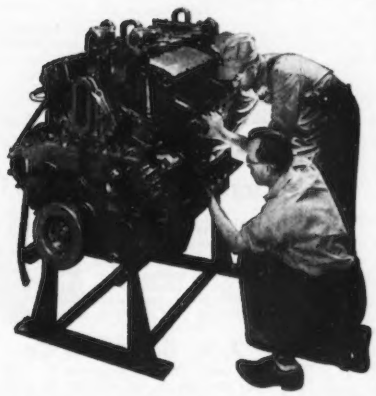
LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities.

BUILT NOT ONCE BUT TWICE!



Cummins is the custom-builder of the Diesel industry. Each engine is built to *fit the job*—and the individual piece of equipment in which it is to be installed. And *every* Cummins engine is built *twice*. First, each engine is assembled, run-in tested. Then it is disassembled completely, and inspected. Finally it is reassembled and tested *again*. This extra care in precision building, Cummins exclusive fuel system, efficient parts and service organization . . . mean *less* "down-time" and *more* power and profits for Cummins users. *See your Cummins dealer.*

Cummins®
CUSTOM BUILT Diesels



Lightweight High-speed Diesel Engines (50-550 hp) for: on-highway trucks • off-highway trucks • buses • tractors • earthmovers • shovels • cranes • industrial locomotives • air compressors • logging yarders and loaders • drilling rigs • centrifugal pumps • generator sets and power units • work boats and pleasure craft

CUMMINS ENGINE COMPANY, INC., COLUMBUS, INDIANA

Export: CUMMINS DIESEL EXPORT CORPORATION • Columbus, Indiana, U. S. A. • Cable: CUMDIEX

Diesel power by CUMMINS

CUMMINS Achieves Diesel

TRADEMARK REG. U. S. PAT. OFF.

"AERO MAPPING SAVED US $7,786"

says Ayrshire Collieries!

MAPS were needed for the development of an Ayrshire Collieries' property in southern Illinois. Costs for surveying, drafting and completing maps by ground methods were $2.92 per acre.

Aero Service mapping planes flew the 21,000 acre property taking reconnaissance photos. These were assembled as a precise mosaic providing general photo coverage for the entire area. Individual prints were delivered, too, for stereo study of benching, outcrop, and other geologic features. Finally, topographic maps (scale 1" = 100 ft.; 5 ft. contours) were compiled for 7,210 acres. Saving for Ayrshire Collieries was $7,786—an economy of 37%!

"We find AERO mapping reliable—faster—and much cheaper," says R. H. Swallow, Chief Engineer of Ayrshire. "All cultural details are secured. Aerial reconnaissance lets us narrow the area for contour mapping to a minimum. AERO saves time and manpower for us."

How much can you save with AERO *mapping?* Photo reconnaissance can be done at a few cents per acre; contour mapping costs will vary according to scale, contour interval, and size of area but they are appreciably less than ground surveys. For more information, write AERO today.

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236 E. COURTLAND ST., PHILA. 20, PA.
Oldest Flying Corporation in the World

TOPOGRAPHIC MAPS • PLANIMETRIC MAPS • PRECISE AERIAL MOSAICS
AIRBORNE MAGNETOMETER SURVEYS • RELIEF MODELS • COLOR PHOTOGRAPHY

AERO MAPS THE FUTURE

I'm interested in safety and lower replacement costs. That's why—when it comes to *structural* wood—I always specify...

BAXCO
CHEMONITE
PRESSURE TREATED LUMBER

TERMITE & DECAY RESISTANT

- CHEMONITE was developed by University of California Scientists.
- CHEMONITE has been proven by over 20 years of use.
- CHEMONITE resists termites and wood-decaying fungi.
- CHEMONITE is non-leaching, clean, odorless and paintable.
- CHEMONITE gives permanent protection to all wood products.
- Approvals: Federal and State specifications; American Association of Highway Officials; Los Angeles City Building Code.

Yes GO with the GREEN
trustworthy as it's color!

FREE brochure gives you the facts!
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PRESSURE TREATED
BAXCO
TIMBER-POLES-TIES-LUMBER
CHEMONITE

BECKMAN—*the leading name in pH—presents another important advancement in instrumentation*

Announcing The BECKMAN MODEL N pH METER

Completely Portable!

Extremely Compact!

. . . and Really Rugged!

In the constantly expanding field of pH, there is wide demand for a *completely portable* battery-operated pH instrument that is low in price, light in weight, compact in size, and amply rugged to be used anywhere—in the orchard, in the oilfields, in textile mills, plating shops, mining and mill operations, food processing plants, laboratories . . . *anywhere*, without dependence upon outside power circuits.

The newly developed Beckman Model N pH Meter not only meets all these requirements, but also many more. Here are the highlights. Check them over. *Never before have unique advantages like these been combined into a single pH instrument!*

OPERATING SIMPLICITY AND ACCURACY . . .

- Accuracy to better than 0.05 pH.
- Low operating cost—less than 2c per hour.
- Built-in temperature compensation—0° to 100° C.
- Fast warm-up—less than 10 seconds.
- "Check Pointer" eliminates need for frequent buffer standardization.
- Batteries are easily checked with the regular panel controls—no need to disassemble the instrument. Clip-mounting of batteries eliminates need for soldering or wiring.

NEW COMPACTNESS AND RUGGEDNESS . . .

- All-metal case—cast aluminum with baked enamel finish to resist wear and corrosion.
- Splash-proof design—fully desiccated internally.
- Shock-proof—each tube is individually shock-mounted.
- Light weight—less than 8 lbs., complete.
- Small, compact—only 4" x 6" x 9½" overall.
- Equipped with the new Beckman Red Label Glass Electrode—virtually unbreakable, covers almost the entire pH range, usable from freezing to boiling.
- By far the most rugged overall construction of any pH meter.

GET ALL THE FACTS on this newest Beckman advancement in pH by contacting your nearest authorized Beckman instrument dealer. Or write direct!

BECKMAN INSTRUMENTS INC.

SOUTH PASADENA 27, CALIFORNIA

Factory Service Branches: Chicago — New York — Los Angeles

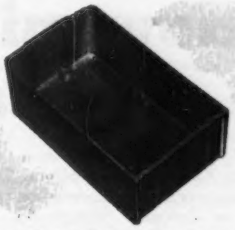
Beckman Instruments include: pH Meters and Electrodes — Spectrophotometers — Automatic Titrators — Radioactivity Meters — and Special Instruments

NEW CONVENIENCE SIMPLICITY RUGGEDNESS

make the Beckman Model N a noteworthy advancement. The following features are typical . . .

ELECTRODE SUPPORT ROTATES alongside case for maximum convenience in carrying. Instrument can be used in either horizontal position (shown at left) or vertical position (above)—whichever is handier.

CONVENIENT CONTROLS not only centralize all operating functions, but also permit checking amplifier circuits and battery condition without opening case or disturbing battery connections.



RUGGED, COMPACT DESIGN withstands rough field and plant service with negligible maintenance. Solid cast-aluminum case is strong, yet light in weight. Beckman Glass Electrode is virtually unbreakable!

There are many other important features designed into the Model N. Be sure to get the *complete* story on this new Beckman development!

B.F.Goodrich

How mine owner gets double wear from BFG tires

THE Allegheny River Mining Company operates an underground coal mine at Cadogan, Pennsylvania. Located in the Lower Kittanning coal vein, the company runs 17 shuttle cars to transport and load coal after it is cut. All cars are now equipped 100% with B. F. Goodrich tires.

These BFG tires are subjected to unusually hard wear, as they travel constantly over coal, rocks and rough road beds. Although operating conditions are most difficult, BFG Universal tires are doing an excellent job at this mine. The tread is giving twice as much wear and longer service than other tires tested. No delays have been caused by tire trouble. Unusually small maintenance and service have been required.

Reports from B. F. Goodrich users everywhere indicate top performance of BFG mine tires as compared with other brands. Specially compounded tread rubber resists cutting. More tires can be recapped because the patented B. F. Goodrich *nylon shock shield* gives extra bruise protection . . . through layers of strong, elastic nylon between the tread rubber and the cord body. This nylon shock shield is an exclusive B. F. Goodrich feature and is found on all BFG tires of 8 or more plies . . . at no additional cost to you!

There's a specially-designed BFG off-the-road tire for every need . . . including the new *all-nylon* tire for coal mines, construction projects, quarry work, strip mining, etc. See your dealer or write for additional information. *The B. F. Goodrich Company, Akron, Ohio.*

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Pardee and Curtin Lumber Co. finds that

Belt reinforced with "Cordura" Rayon troughs well on 1,500′ slope conveyor

STRONGER AND MORE FLEXIBLE, this belt (above) reinforced with "Cordura" rayon hauls 200 tons an hour up a 134-foot lift on a 12 per cent maximum grade. It operates under maximum tension of 4,954 pounds, and is spliced with a Flexco #500 hinge-type mechanical splice. (Below) Mine Superintendent Mr. Max Weaver with 4,229 feet of new belting reinforced with "Cordura" rayon which will soon replace sections of the present mother belt.

Whether carrying a maximum load or going up empty, this 30-inch slope belt at Pardee and Curtin's Bolair Mine #1, Bolair, West Virginia, trains perfectly all the way. It was manufactured by the Goodyear Tire and Rubber Company on a 4-ply fabric carcass made of Du Pont Cordura* High Tenacity Rayon.

Engineers at Bolair have used "Cordura" reinforced belting since 1947. They like its easy troughing, high strength, and minimum stretch. Recently they ordered 10,000 feet more to replace sections of conventional belting in the mother belt.

Why do belts reinforced with "Cordura" rayon train better? Because "Cordura" yarn is inherently stronger than yarn of natural fibers, manufacturers can make a belt thinner . . . with fewer plies . . . yet stronger. These thin belts are more flexible, trough better, have less tendency to crack and separate. Furthermore, their low stretch saves costly shut-downs for take-up and resplicing.

Before you order your next conveyor belt, be sure to inquire about the use of "Cordura" rayon in belts. We'll be glad to send you the names of suppliers of the new belts built on "Cordura." We'll also give you full information about this Du Pont fiber in a new booklet "Sinews for Industry." For your free copy, address: Rayon Division, Room 4421-J, E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Del.

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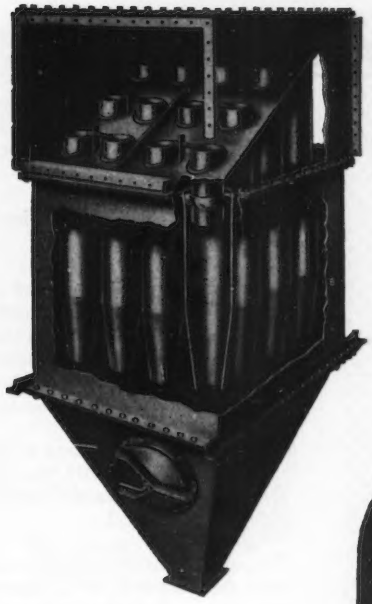

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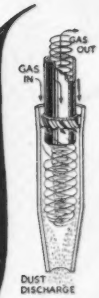

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Make	Relative Space Requirements In Sq. Ft.	In Cu. Ft.
Multiclone	1.0	1.0
Collector A	2.1	1.8
Collector B	5.9	3.2
Collector C	6.8	3.9

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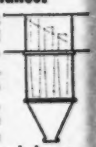

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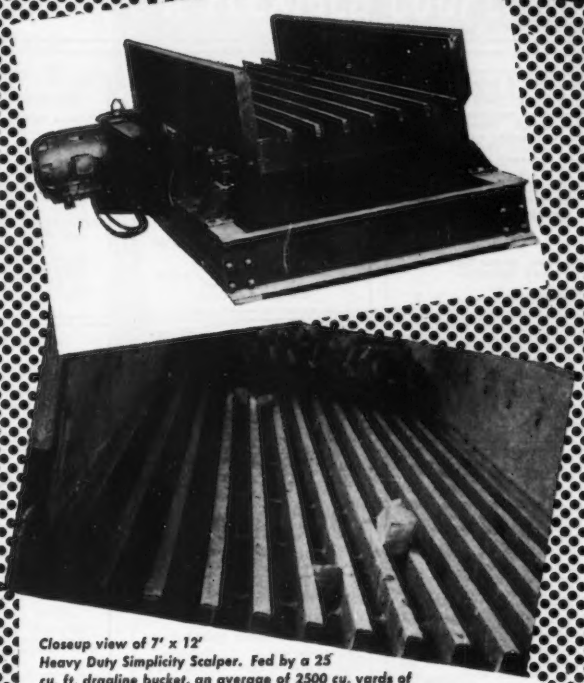

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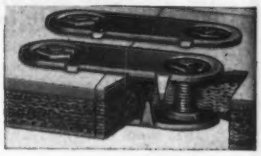

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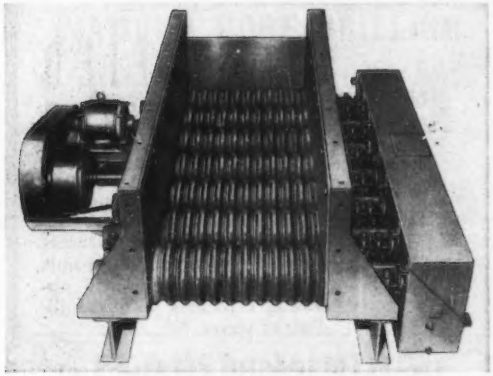

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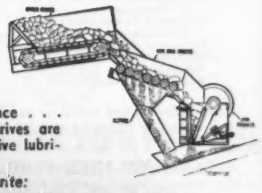

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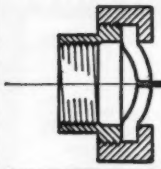

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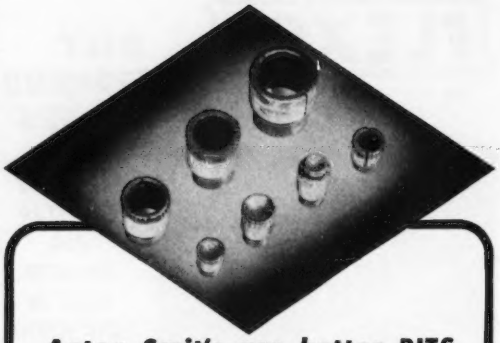

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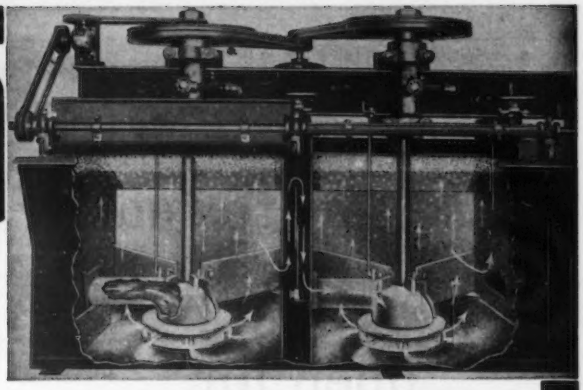

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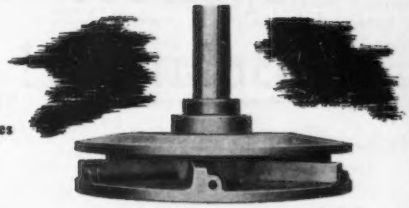

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P7942, Engineering & Mining Journal
330 West 42nd St., New York 18

REPLIES (Box No.): Address to office nearest you
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TWO EXPERIENCED, technically trained Assistant Superintendents required for large Electrolytic Copper Refinery in Northern Rhodesia. Preferred Age 30 to 45. One position available for man qualified in all phases of tank house Operation. A second position available for man experienced in casting horizontal and vertical shapes from reverberatory and electric furnaces. Applicants to state experience in anode casting. Salary to be negotiated according to qualifications and experience. Apply to P.O. Box 172, Kitwe, Northern Rhodesia.

AGGRESSIVE JUNIOR Executive, 35-40, good personality, with legal experience and knowledge of requirements of mining company operating large and small domestic properties. Executive office located in New York City. Married man preferred. Salary and advancement will equal abilities of individual. Please submit full educational and business history. P-1390, Engineering & Mining Journal.

COMPTROLLER—MINING company, operating and small properties in the United States, with executive offices in New York City, requires services of personable man, about 40, preferably married, with some mining experience. Limited traveling will be necessary. Submit full personal and business history. Salary commensurate with abilities of individual. Reply P-1393, Engineering & Mining Journal.

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Ore mining organization has opening in its N. Y. office for experienced mining engineer as assistant to the manager of its project department. Must be qualified to evaluate ore mining projects.
Duties involve inspection of ore deposits. Submit complete resume, stating references and salary desired.

P1293 Engineering & Mining Journal
330 W. 42nd St., New York 18, N. Y.

OPEN FOR ENGAGEMENT

Graduate mining engineer and executive, until recently general manager of a large group of mines, wants employment with a reputable company. Experienced in all phases of mining operations, development, costs, reports and labor relations. Married. References.

PW 1229, Engineering & Mining Journal
520 N. Michigan Ave., Chicago 11, Ill.

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MINING ENGINEER with 30 years mining experience desires Sales Engineer position with producer of Mining and/or Industrial equipment. To travel the Southern states. Commission basis, with travel expense advance against earned commissions. PW-1231, Engineering & Mining Jl.

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MINING ENGINEER, 37, experience operation, examination, mineral economics, raw material problems, U.S. and foreign, seeks connection where reliability, resourcefulness count. PW-1531, Eng. & Min. Jl., 330 West 42nd St., N.Y. 18.

BUSINESS OPPORTUNITY

EXPERIENCED ENGINEER seeks associate with capital to develop Western defense metal property. References exchanged. BO-1433, Engineering & Mining Journal.

PATENTS

CONSULT: Z. H. POLACHEK
Reg. Pat. Attorney, 1234 Broadway, New York 1, N. Y.

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Large engineering firm wishes to acquire several complete plants through purchase of (1) capital stock, (2) assets, (3) machinery and equipment whole or in part. Personnel retained where possible, strictest confidence.
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P & W PULVERIZERS

3—Type E-32 practically new Coal Pulverizers, complete with 75 H.P. motors, blowers and all equipment. Used approx. 2 years. Purchased new 1943.

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25 Broadway
New York 4, N. Y., June 28, 1951.
DIVIDEND NO. 173
The Board of Directors of Anaconda Copper Mining Company has declared a dividend of Seventy-five Cents (75c) per share on its capital stock of the par value of $50 per share, payable September 20, 1951, to stockholders of record at the close of business on August 21, 1951.
C. EARLE MORAN, Secretary & Treasurer.

PATENTED PROCESS

Inventor of new electronic process for concentrating metallic ores wants help in developing and marketing same. Process gives separation and even some selection of relatively coarse dry material and is fully covered by American and Canadian patents.

BO 1314 Engineering & Mining Journal
330 W. 42nd Street
New York 18, N. Y.

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Proven Lead and Barite producing mines. Will also sell completed enclosed mill, mining and milling equipment, shop, camp house, etc. BARGAIN for the right party. Will also consider leasing on royalty basis.

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Located in Northern California in Gold district; no allied metals. Not a prospect; buildings, water, power and some machinery on property.

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Contractor desires contracts, no share or percentage proposals, for open pit mining and surface development including access roads in Western United States. Have modern machinery and experienced personnel.

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CW1319—Engineering & Mining Journal
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1—#21½ Vulcan Sgl. Drum, with U-6 Gas Power Unit, condition like new
1—15 HP Box I. Wks. Sgl. Drum with 15 HP Slip-ring Motor
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1—7½ HP Hoist With Motor

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2—#24, 8-cell Denver "Sub-A"—43" x 43" cells—wood tanks, complete with motors and new rubber impellers

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25 Tons 85# Relayers
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Manitowoc model 2000B 1 ¼ c.y. Combination standard shovel and dragline with Caterpillar D-13000 diesel. Good condition.
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12"	4	1/16"	1/32"	28 Oz.
14"	4	1/16"	1/32"	28 Oz.
16"	4	1/8"	1/32"	28 Oz.
18"	4	1/8"	1/32"	28 Oz.
20"	4	1/8"	1/32"	28 Oz.
20"	5	1/8"	1/32"	28 Oz.
24"	4	1/8"	1/32"	28 Oz.
24"	5	1/8"	1/32"	28 Oz.
26"	5	1/8"	1/32"	28 Oz.
30"	4	1/8"	1/16"	32 Oz.
30"	5	1/8"	1/16"	32 Oz.
30"	6	1/8"	1/16"	32 Oz.
36"	6	1/8"	1/16"	32 Oz.
42"	5	1/8"	1/16"	32 Oz.
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1—8½" x 29¾" Roots rotary blower.
1—10" x 18" new Sutorbilt rotary blower.
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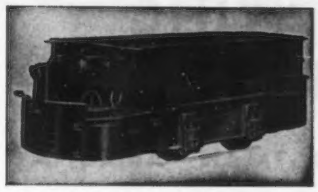

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1—Morse #2 low head thickener mechanism and super-structure for 16' x 8' tank.
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2—4½ Vulcan 52 HP single drum.
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1—150 HP single drum hoist.
1—60-100 HP Vulcan single drum.
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1—30" x 24" new Morse batch mill.
1—4' x 4' standard ball mill.
2—6' x 36" Hardinge conical ball mills.
2—#64½ Marcy ball mills.
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2—8' x 22" Hardinge conical pebble mills.
1—3' x 8' Dewco tube mill.

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1—80 CFM 6" x 5" Worthington.
1—50 CFM 6" x 6" Gardner.
1—139 CFM 8⅜" x 4¾" x 5" Chicago-Pneumatic.
1—156 CFM 7" x 5¾" x 5" Gardner-Denver.
1—172 CFM 10½" x 4⅜" x 6" Rix.
1—293 CFM 12" x 6½" x 10" Ingersoll-Rand.
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48'x26', 48'x45', 34'x40', 60'x50', 70'x35', 80'x60', 84'x50, 80'x41' & 90'x70'.
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Qu	HP	Make	Type	Volts	RPM
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1	400	G.E.	KT-412	2200	435
2	300	Whse.	CS-890	2300	1750
1	200	Whse.	CS-873C	2200	1160
1	200	Al.Ch.	AR	440/220	580
2	125	Al.Ch.	AR	2200	1750
1	125	Whse.	CS-761C	440/220	1750
1	125	C.W.	126-G	440/220	430
2	100	Whse.	CS-663C	440/220	1750
1	100	G.E.	IK	440/220	1800
1	100	Al.Ch.	AR	2200	1160
1	100	Al.Ch.	AR	550	690
1	100	F.M.	H241B	440/220	435
1	100	Whse.	CS-938	2200	495
1	78	G.E.	I-K15	440/220	570
1	75	Al.Ch.	AR	2200	1765
1	75	Al.Ch.	AR	2200	1750
1	75	Al.Ch.	AR	2200	690
1	50	G.E.	KT	440/220	1160

SYNCHRONOUS MOTORS
3-Ph., 60-Cy.

Qu	HP	Make	PF	Volts	RPM
1	3000	Whse.	80	4800/2400	720
1	700	G.E.	80	2300	720
1	600	Whse.	80	2400	720
1	400	Whse.	80	440	600
1	300	Whse.	80	440	514
1	150	G.E.	100	2200	900
1	150	G.E.	100	550/2200	600
1	150	G.E.	80	550/2200	650
3	125	El.Mchy.	100	4800/2400	900
1	125	G.E.	80	2200	900
2	100	Whse.	80	440/220	1800
1	100	Whse.	100	2200	1200
1	100	Ideal	80	220/440	900
2	100	G.E.	80	220/440	600

SLIP RING MOTORS—CONSTANT DUTY—3-Ph., 60-Cy.

Qu	HP	Make	Type	Volts	RPM
1**	3000	G.E.	MT	2200	356
1**	1200	C.W.	SR	2200	237
2**	1000	Al.Ch.	ANY	2200	235
1**	600	G.E.	MT-20	2200	360
1	500	Whse.	C.W.	4600/2300	514
1	500	Al.Ch.	ANY	4000/2300	514
1**	400	Al.Ch.	ANY	2200	514
2	500	G.E.	I-16-M	2300	450
2	400	G.E.	MT-412	2200	450
1	300	G.E.	I-15-M	2200	1200
1	300	Al.Ch.	ANY	2200	514
1	250	G.E.	MT-414	2200	300
1	200	G.E.	I-16-M	2200	585
1	150	G.E.	I-13-M	2200	1750
1***	125	Whse.	CW-870	2200	870
1	100	F.M.	H20C	440/220	900
1	75	G.E.	IM	440/220	695
1	75	Whse.	CW-7540	440/220	690

** Mill type pedestal bearing. *** 3 bearing.

MOTOR GENERATOR SETS

Qu	KW	Make	RPM	Volts DC	Volts AC
1	2400 3U	Al.Ch.	720	525	4800/2400
1	1500	Whse.	514	250	4600/2300
2	1000	G.E.	514	575	4000/2300
1	500 3U	Whse.	1200	120/240	2300/440
2	500	C.W.	720	575	4000/2300
1	500	C.W.	720	250/275	4000/2300
1	500	C.W.	720	250/275	2300/440
1	200	Ridgway	900	250	2300
1	155	G.E.	720	250	2300/440
1	150	G.E.	1200	500	2300/440
1	100	Ridgway	1200	275	4000/2300
1	85	C.W.	1200	250	2300/440
1	75	Star	1200	230	440/220
1	75	Al.Ch.	900	250	2300
1	50	Burke	1800	240	440/220
1	30	Reliance	1800	250	440/220
1	25	Whse.	1200	120/240	440/220
1	20	Reliance	1800	250	440/220

(3U—3-unit set.)

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Qu	KVA	Make	Type	Phase	Voltage
1	7500	G.E.	H	3	33000/29700–13800/12600
3	1500§	Gregory	(X)	3	4160–480
3	250	Packard	OISC	1	13200–2200
3	130	G.E.	H	1	19000/9500–550/2200
3	100	Whse.	SS	1	12075/10355–230/460
3	100	G.E.	HT	1	33000–2400
3	50	Al.Ch.	OISC	1	22000–220
2	50	Wagner	HE	1	13200/11880–575/287
3	50	Penna	OISC	1	2400/4160–Y-120/240

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Qu	HP	Make	Type	RPM
1***	3000	Whse.	Encl.(Rev.)	600
1***	2400	Whse.	Encl.(Rev.)	600
4***	1500	Whse.	Encl.(Rev.)	600
4***	1200	Whse.	Encl.(Rev.)	600
4***	800	Whse.	Encl.(Rev.)	600
1	350	G.E.	CD-149	1150
1	325	Whse.	QM-660.6	450/900
1	200/250	El.Dy.	No. 32	400/1200
1***	200	G.E.	MPC	500/1200
1	200	Whse.	Mill	300/1200
1	300	Whse.		240/300
1	180	G.E.	MPC	400
2*	150	C.W.	AI-H	890
1***	125	Whse.	SK-190	600
1	100/125	Rel.	1995-F	300/1200
2	100	Rel.	1050-T	400/1200
1	90/160	G.E.	MPC	625/1125
1*	50/75	Rel.	1995-F	300/1200
1	35	G.E.	RF-14	500/1500
1	35	G.E.	CD-125	400/1200
1	35	G.E.	CD-147	300/1200
1	35	Rel.	35P	250/1000
1	32½	Whse.	SK-150	400/1200
1*	30/75	Whse.	SK-151L	400/1200
1	30	Al.Ch.	E-145	400/1200
1	30	G.E.	CDM-105	875/1750
2	27½	El.Dy.	15S	450/1350
1	25	G.E.	RF-13	400/1600
1	25	G.E.	CD-123	400/1200
1	25	Whse.	SK-140	400/1200
1	25	Whse.	SK-111L	250/1000
2	20	Al.Ch.	E-010	400/1200
3	20	G.E.	CD-123	300/1200

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1—New Telsmith 36" Gyrasphere Type S Secondary Crusher with grooved pulley.

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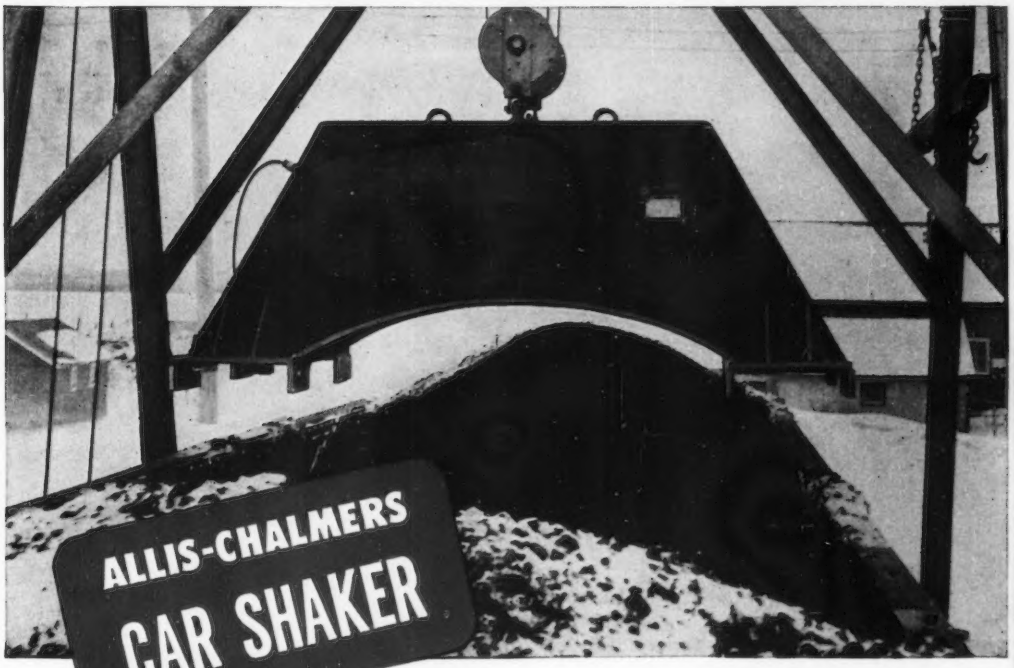

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Over half a million mine cars on TIMKEN® bearings!

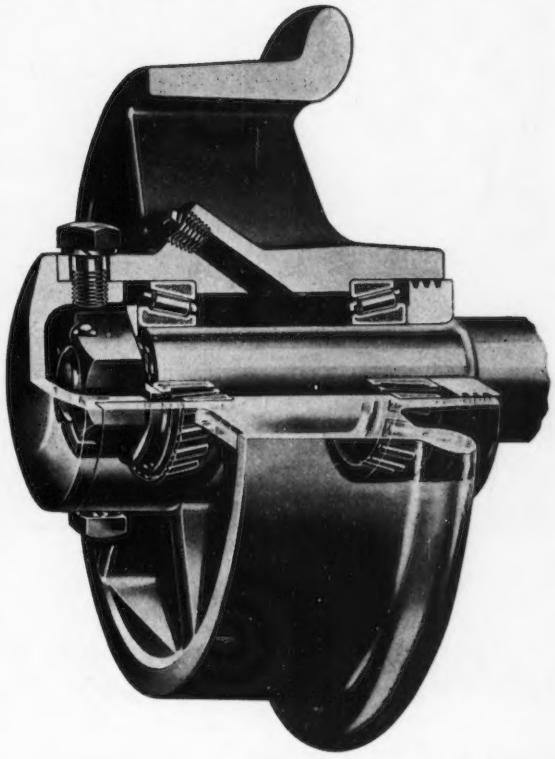
Here are 3 main reasons why

1. MINIMUM MAINTENANCE is the inevitable result of mounting mine car wheels on Timken tapered roller bearings. Simplicity of design, as shown in the mounting at right, provides for easier inspection, assembly and disassembly. Adjustable feature permits operators to obtain maximum life from the bearings—dust collar makes periodic lubrication more effective.

2. GREATER LOAD CAPACITY is found in Timken bearings because loads are carried on line of contact between rollers and races. Case hardened Timken fine alloy steel provides bearing parts with a tough shock-resistant core and a hard wear-resistant surface. And because Timken bearings carry both radial and thrust loads in any combination, no special thrust washers or thrust bearings are needed.

3. ECONOMY OF OPERATION results when cars are equipped with Timken tapered roller bearings. True rolling motion and the incredibly smooth surface finish of Timken bearings keep friction to a minimum — permit more cars per locomotive or less power for hauling the same number of cars.

For minimum hauling cost per ton insist on Timken bearings for your car wheels.



CUT YOUR COSTS BY SPECIFYING

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

The Timken Roller Bearing Company, Canton 6, Ohio. Canadian Plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◎ AND THRUST →◎← LOADS OR ANY COMBINATION ✳